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RESEARCH REPORTED HERE WAS DESIGNED TO DETERMINE THE EFFECTS OF INDUCTIVE, DEDUCTIVE, AND INTUITIVE APPROACHES FOR TEACHING SELECTED GEOGRAPHIC CONCEPTS. THE EXPERIMENT WAS CONDUCTED IN A CULTURALLY ADVANTAGED PRIMARY SCHOOL ENVIRONMENT USING INSTRUCTIONAL MATERIALS AND A CRITERION PRETEST AND POST-TEST. THE MATERIALS AND TESTS WERE DEVELOPED SPECIFICALLY FOR THIS STUDY TO TEACH THE SELECTED CONCEPTS AND TO EVALUATE UNDERSTANDING AS WELL AS THE ABILITY TO APPLY THE CONCEPTS. PREPARATIONS FOR THE STUDY INCLUDED ORIENTATION OF TEACHERS, SELECTION OF EXPERIMENTAL AND CONTROL GROUPS, AND PRETESTING THE PARTICIPATING CHILDREN. AFTER INSTRUCTION, POST-TESTS WERE ADMINISTERED, MACHINE PROCESSED, AND ANALYZED. RESULTS INDICATED ALL THREE APPROACHES WOULD BE SUCCESSFUL FOR TEACHING THE SELECTED CONCEPTS TO THE PRIMARY GROUP STUDIED. IT WAS CONCLUDED THAT GEOGRAPHIC CONCEPTS COULD BE TAUGHT AT THE SECOND- AND THIRD-GRADE LEVELS. THE DEDUCTIVE APPROACH WAS CONCLUDED TO BE MOST APPROPRIATE FOR TEACHING THE SELECTED CONTENT TO THE POPULATION STUDIED. SUGGESTIONS ARE PRESENTED FOR FURTHER STUDY OF CONCEPT FORMATION RELATED TO PRIMARY GRADE SOCIAL STUDIES. (WN)

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THE ABILITY OF CERTAIN PUPILS TO UNDERSTAND AND APPLY SELECTED CONCEPTS AND GENERALIZATIONS IN GEOGRAPHY

Cooperative Research Project No. 5-8426-2-12-1

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THE PROBLEM

Educators and specialists in the various social sciences (e.g., McAulay, 1962a; Spodek, 1963; and Kaltsounis, 1961) have expressed a concern that the present curricula organizations for the social studies have underestimated the range of ability and the interests of primary grade children. Social studies education in the elementary school has been largely characterized by the "expanding horizons" approach which has stressed the study of the home, school, community and community helpers for primary grade children. Research (Harrison and Solomon, 1964) in the social studies at the primary grade level has indicated that children have a knowledge of and are interested in geographic areas far from their immediate environment. Studies have tended to indicate that primary grade children can learn a great deal more advanced social studies content than has been previously expected or provided.

The main endeavors in current curriculum reform in the social studies center on the development of concepts, generalizations and themes or what Bruner (1960) terms the "structure of the discipline." The National Council for the Social Studies (Michaelis, 1962) the National Council for Geographic Education (Hill, 1963) and Educational Services Incorporated (1964) are among the many agencies which have recently proposed or developed suggested approaches which are based on the structure of social science disciplines and the method of inquiry in a given discipline. The contention of Bruner that "any subject can be taught effectively in some intellectually honest form to any child at any stage of development" (Bruner, 1960, p. 33) is one which offers a challenge which this project dealt with as it applied to the discipline of geography and to primary grade pupils.

Specialists in geography, such as James (1959a), Bacon (1963), and Warman (1963), have called for the return of geography to its proper place in the social studies curriculum of the elementary school. They believe that the discipline of geography can provide unity and coherence for a social studies curriculum which will prepare pupils to comprehend more fully the world in which they live. More specifically, they recognize a need for a movement away from the prior stress on place geography, which has characterized geographic education at the elementary level, and a movement toward the development in students of the ability to relate factual information to the broader framework of concepts and generalizations.

The study of concepts, concept formation and concept attainment in general and the specific study of concepts, concept formation and concept attainment in children are central to the understanding and application of concepts and generalizations proposed by this study. However, most studies of concept formation are concerned with differentiation tasks which in reality are at a lower level of conceptual ability than that generally required by curriculum content in the schools (Woodruff, 1964). Studies (Russell, 1960) tend to indicate that young children, if given sufficient experience, can learn concepts and generalizations which are far more encompassing than the factual orientation which has characterized curriculum efforts in the elementary school in many fields, including the discipline of geography.

This project proposed to investigate the relative effectiveness of three approaches to instruction on the ability of primary grade pupils to understand and apply selected concepts and generalizations in geography. The approaches to instruction have been termed inductive, deductive and intuitive.

The inductive approach was characterized by guided discovery learning. Instructional approaches involving discovery techniques are consistent with inductive approaches in which one reasons from specific instances to a more general case. While there is conflicting evidence as to the effectiveness of the discovery approach at all educational levels (Ausubel, 1961), guided discovery learning is considered to be effective and desirable at the elementary level (Kersh, 1958).

The deductive approach was defined as verbal reception learning. This is the conventional mode of instruction at the elementary level. This instructional approach involves the presentation of previously generalized material to learners to be assimilated by them for future use. This is consistent with the deductive approach in which one reasons from the general to the specific.

The intuitive approach was similar to the inductive or guided discovery approach. However, the intuitive approach offered the child only a limited set of cues from which he was to grasp the significance or the structure of the subject at hand (Wallach, 1961). This instructional approach would be consistent with the process of intuitive thinking in which one, having a familiarity with the field of knowledge under consideration, "leaps" to a concept or generalization without reliance on specific analytic approaches.

Much attention is being given to the pressing and difficult problem of educating the child in culturally deprived areas. Efforts have been concerned with the development of curricular experiences which will fit more specifically the learning characteristics and abilities of the child who lacks the cultural influences of the "average" home in American society. The author contends that the primary grade child from the upper and upper-middle classes and a high socio-economic suburban community, has educational needs in the social studies which have not been met in a manner commensurate with his background of experience and learning characteristics. The investigator has studied the culturally advantaged child from a high socio-economic suburban community to determine if his educational needs are being met in the primary grades in the field of geography.

Definition of Terms

The terms used in describing the objectives of this study are defined as follows:

Culturally advantaged: This term is used in contradistinction to the generally accepted and widely used term, culturally deprived. Culturally advantaged children come from the upper and upper-middle social class home environments; they have enjoyed economic, social and educational advantages which exceed those of the "average child."

Primary grades: The first three grades of the elementary school.

Understand: The ability to translate a communication (e.g., concept) in terms of one's own experience background; the ability to comprehend interrelationships among the various parts of a communication (Bloom, 1956, p. 89).

Apply: The ability to use, and to know when to use, an appropriate abstraction or communication (Bloom, 1956, p. 120).

Concepts: "Concepts are cognitive organizing systems which serve to bring pertinent features of past experience to bear on a present stimulus object" (Vinacke, 1954, p. 528).

Generalizations: Generalizations state relationships between two or more concepts (Brownell and Hendrickson, 1950, p. 106).

Geography: "Geography is that field of learning in which the characteristics of particular places on the earth's surface are examined. It is concerned with the arrangement of things and with the associations of things that distinguish one area from another" (James, 1959b, p. 10).

Inductive approach: A guided discovery approach in which the teacher guides pupils inductively to a statement of the concept or generalization under consideration.

Deductive approach: A verbal reception learning approach in which concepts and generalizations are presented in "final form" to pupils and then applied to specific instructional materials.

Intuitive approach: A guided discovery learning approach which parallels the inductive approach yet gives only limited cues from which pupils are to "leap intuitively" to the concept or generalization under consideration.

OBJECTIVES AND HYPOTHESES

The major objectives of this study were to determine:

1. If primary grade pupils from a culturally advantaged community could understand and apply selected concepts and generalizations in geography.

2. Which of the three approaches to instruction--inductive, deductive and intuitive--was most successful in bringing about an understanding and application of the selected concepts and generalizations.

3. If a particular primary grade, in a culturally advantaged community, was more appropriate than others to begin a study of the geographic concepts and generalizations specified for the study.

4. If there was any difference between the ability of boys and girls to understand and apply the selected concepts and generalizations in geography.

The null hypotheses established for the study were as follows:

When criterion scores are controlled by the analysis of covariance which partials out the influence of pretest performance and intelligence test scores:

1. No significant difference on mean scores for the dependent variable will be found between primary grade pupils subjected to three experimental treatments and control status.

2. No significant difference on mean scores for the dependent variable will be found between primary grades when grouped by grade level.

3. No significant difference on mean scores for the dependent variable will be found between primary grade pupils when grouped by sex.

4. No significant difference on mean scores for the dependent variable will be found between the three experimental treatments, control status and grade level.

5. No significant difference on mean scores for the dependent variable will be found between the three experimental treatments, control status, and sex.

6. No significant difference on mean scores for the dependent variable will be found between grade level and sex.

7. No significant difference on mean scores for the dependent variable will be found between the three experimental treatments, control status, grade level and sex.

RELATED RESEARCH AND THEORETICAL FOUNDATION

Social Studies in the Primary Grades

Hanna (1962) proposes that primary grade social studies should begin with a study of the communities closest to the child, i.e., the home and the school, and then expand progressively outward in concentric circles to include the neighborhood community and its helpers.

Hanna advocates the use of the expanding communities approach in conjunction with what he has identified as the nine basic human activities through which men have met and solved their problems. Ten doctoral students at Stanford University under the direction of Hanna have compiled lists of significant generalizations derived from social science textbooks and other literature related to the nine basic human activities. A second group of ten doctoral students, under Hanna's direction, will refine and restate the derived generalizations for use in the expanding communities sequence. Further studies are planned to investigate how these generalizations might be incorporated in learning experiences in the elementary school to allow for inductive attainment of the generalizations by elementary pupils. Hanna's (1963) purpose in directing these studies was to provide substantive content for teachers, administrators and curriculum workers in the development of social studies curricula for the elementary school.

Many studies have taken place in recent years to investigate the knowledge which primary grade pupils have of areas other than those included in the primary grade expanding communities sequence. Harrison and Solomon (1964, 1965) reported published and unpublished research in the social studies from the years 1960 to 1964. Many of the research findings which they have cited indicate a need for upward revision in our thinking relative to what elementary school children can accomplish at the primary grade level.

A study by McAulay (1962a) indicates that first graders had a knowledge of and an interest in geographic environments which differed considerably from their own; they were interested in geographic areas such as dry lands, wet lands, and hot and cold lands. Second graders in this study showed similar but broader interests and had deeper understandings of people who lived in those areas. The third graders in this study were found to be very inquisitive about climate, vegetation, animal life and people of the various continents.

Another study by McAuley (1962b) pointed out that second grade children could use maps to find information about physical environments which were in direct contrast to their own; pupils were able to follow map directions more efficiently in locating places which are further removed from their local environment rather than close to it.

Cammorata (1963) conducted a study and concluded that primary grade children are interested in places far removed from their local environment. She concluded from her study that primary grade children need and are capable of undertaking the study of a great deal more in social studies content than primary grade children of the past. Cammorata's findings and the expressed feelings of many writers in the field of elementary school social studies are that the impact of television, the transitory nature of the American population and the travel experiences of younger children have provided them with the background of experience which makes them able to deal with areas beyond their immediate environment.

In an exploratory study with first grade children, Rusnak (1961) found that they were able to deal with a considerable number of historical and geographic concepts; the first graders in her study showed a particular interest in distance and climate in geography. She found that first graders could use globes rather easily, divide the globe into regions and locate the type of homes found in those regions. Rusnak noted some limitations of first grade pupils in her study. (1) The pupils were unable to read materials which were available in topics which were of interest to them; (2) first grade pupils found it difficult to deal with more than one concept at a time; (3) if first grade pupils are to attain understanding of concepts, the teacher must give direction and close guidance with emphasis on continuous explanation and illustration.

Spodek (1963) found that children in the kindergarten were able to learn concepts in social studies relating to the harbor. He also found them able to begin to understand some time sequences in history.

Sabaroff (1958) notes that primary grade children are able to reason and generalize from map study if the particular topics treated and the methodology used are within the experience range of children. Rushdoony (1963) indicates that third graders can learn many of the map skills which have traditionally been taught at the fourth and fifth grade levels.

Studies by Mugge (1963), Kaltsounis (1961) and Lowry (1963) indicate that primary grade pupils already know a considerable amount of the social studies material which is provided for them in school programs. Mugge and Kaltsounis found that the primary grade pupils knew better than one-third of the "widening horizons" material which was prescribed for study, while Lowry found that second graders in her study achieved a mean score of 85 percent on a survey test composed of concepts included in six second grade social studies textbooks. These findings lend validity to the concerns cited earlier regarding the need to revise the content of the primary grade social studies.

Smith and Cardinell (1964) concluded that children do have interests beyond the immediate environment and much of this interest is due to the viewing of television. They found children in the kindergarten to possess distinct concepts of some terms used in the social studies. They indicate a need for more effective instruction in geographic terms in the primary grades. LaDue (1963) also found elementary school children to have an interest in and a knowledge of places beyond their immediate environment and beyond those places generally incorporated into the expanding communities approach.

Mugge (1963) tested second graders to determine whether they had information which dealt with content beyond the immediate environment. She used a definition questionnaire and experience questionnaire and personal interviews. She concluded that although the children were able to answer correctly more than one-third of the questions on her information test and more than half of the definitions, they lacked "precision" in their answers and found it difficult to keep two factors in mind at one time. She pointed out that the children could not keep cities, states, and countries in their proper hierarchical order. She further maintained that the travel experiences of children were meaningless because the children could verbalize little of their travel experiences. On these bases, she questioned the readiness of young children for the comprehension of studies of places far from the immediate environment even though the primary grade children in her study evidenced some knowledge about these places.

Concept Formation and Concept Attainment

The central concern in the development of new curricula at all educational levels is the acknowledgment that the framework for each discipline should be composed of the concepts and generalizations within that discipline. Formulated as a reaction against the factual type of orientation, which has characterized many curricula offerings in the schools of the past, this has particular application to geography at the elementary school level. It has been assumed that the stress on concepts and generalizations in curricula design will allow pupils to relate meaningfully the content of a given discipline; Bruner has stated forcefully that "facts simply learned without a generic organization are naked and useless untruths" (1959, p. 185).

The study of concept formation or concept attainment in children contains a considerable body of literature. However, the research evidence deals with limited phases of concept formation making it difficult to gain the comprehensive point of view important to curriculum development in the elementary school. Vinacke (1954) asserts that the stress on language and vocabulary development has not illuminated the process of concept formation; he also states that the categorization of concept formation behavior in terms of chronological age groups has yielded a false impression of this process. The research in concept formation in children has left many unanswered questions which, according to Vinacke, give rise to confusion.

The research methods used to determine the process of concept formation in children generally take two forms. One generally accepted procedure is known as the interview and questionnaire method, often called the clinical method which has been characteristic of Piaget's work. In this method, the child is questioned about some object or activity which he has perceived. On the basis of his answers, inferences are drawn as to the manner in which the concept had been formed or as to the ability of a particular age group to form a concept. A second method can be termed the performance method. This occurs when a child is placed in a situation which requires a performance of a criterion behavior for a concept to be formed. For example, a child may be presented with a series of cards and his object is to determine the concept that the experimenter has in mind. A reward generally follows the "discovery" of the concept.

Berelson and Steiner (1964) and Carroll (1964) point out that there is a considerable gap between the findings of the psychologist and the conditions under which he works with concepts in the psychological laboratory, and the experiences of teachers in the classroom teaching for the attainment of concepts included in the curriculum guides of the schools. Carroll sees little continuity between the inductive, often non-verbal laboratory type of concept learning, and the more deductive, verbal explanatory type of teaching which is characteristic of learning experiences in the schools. He maintains that the concepts generally taught in schools are really "new" concepts for the child and not an artificial combination of familiar attributes.

Typical of the artificiality of laboratory research studies in concept formation is an experiment by Johnson and O'Reilly (1964). In this study, the child was asked to differentiate between a "dunkle bird" and a "gunkle bird" by use of a card sorting technique. The defining task that the child was to discover was that the "gunkle bird" had a black tail. Carroll is referring to the fact that many of the concepts taught in school depend upon a network of related or prerequisite concepts which are difficult to attain when compared with the defining of criterial attributes for concept attainment utilized by a psychologist in a learning laboratory.

Berelson and Steiner (1964) assert that laboratory studies of human learning have concentrated on the simple or mechanical processes, such as those where memorizing items or performing tasks become the criterion. This, they believe, is due in part to the complexity of attempting to study understanding and thinking, and in part to the view of some experimenters who believe that principles of learning may emerge from analysis of simple situations.

Bruner makes a distinction between concept formation as opposed to concept attainment. He views concept formation as "the first step en route to attainment"(1956, p. 22). He defines attainment as "the search for and the testing of attributes that can be used to distinguish exemplars from non-exemplars of various categories" (1956, p. 233). The detailed studies described by Bruner analyze the reception and selection strategies employed by adult subjects in determining how they use predictable defining attributes in classifying objects of study. However, the experiments and the strategies of selection and reception in concept attainment described by Bruner once again lack the direct relevance to the kinds of verbal learnings and curricula experiences which take place in the elementary school classroom.

Bruner and Piaget: Implications for Elementary School Social Studies

Among other writers in the field of social studies, McKeachie (1964) pointed out a need for research to clarify the positions of Piaget and Bruner as they relate to the teaching of the social studies. The studies of Piaget have identified a developmental pattern in children's thinking in which maturation influences cognitive processes. Bruner, on the other hand, has hypothesized that a child can learn any subject regardless of his stage of development.

Bruner's position is characterized as follows:

> We begin with the hypothesis that any subject can be taught effectively in some intellectually honest form to any child at any stage of development. It is

> a bold hypothesis and an essential one in thinking about the nature of a curriculum. No evidence exists to contradict it; considerable evidence is being amassed that supports it (1960, p. 33).

Bruner's hypothesis regarding children's thinking must be considered within the context of his structure thesis. The essence of structure, for Bruner, is the understanding of a subject so that other things may be meaningfully related to it.

Inhelder and Piaget (1958) have identified four stages in the development of the child's reasoning process. The first stage is identified as the sensorimotor stage. The second, third and fourth levels or stages which are appropriate for this study are identified as preoperational or representational, concrete operations, and formal operations.

The preoperational or representational stage is described in terms of symbolic play, internalized imitation and language development. Reasoning in this stage is tied to action and lacks generalization. Thought groupings become evident during this period but they are tied to perceptual appearances and are unstable. Inhelder and Piaget identify this stage as occurring during the ages of four to seven years.

The stage of concrete operations is one where basic concepts are acquired and organized into stable cognitive structures. Thought processes have become less egocentric but have not reached the abstract level where the child is capable of applying generalizations to all situations. This stage occurs between the ages of seven to eleven, according to Inhelder and Piaget.

The stage of formal operations is said to occur between the ages of twelve to fourteen. Inhelder and Piaget believe that the adolescent is capable of hypothetico-deductive reasoning, that he is able to think beyond the immediate present and perceive and formulate hypotheses and theories about possibilities on the basis of formal assumptions.

Piaget maintains that egocentricity in the child during the preoperational stage leads to a reasoning capacity which is not deductive. He believes that logical reasoning is a demonstration of relationships and that the child does not perceive a need for logical demonstration before the ages of seven to eight. Piaget has found that the tendency of the child prior to age seven or eight is to juxtapose propositions rather than determine or state their logical or causal relationships (Piaget, 1959).

The stage of concrete operations is one in which the child, working with concrete perceptions or operations, is able to classify and determine causal relations; yet, Piaget maintains that the mental structures which the child is able to construct during this stage never go beyond the level of elementary logical groupings. This is attributed to a lack of maturation on the part of the child.

Having reviewed the hypotheses advanced by Bruner, and pertinent aspects of Piaget's work which are related to the study undertaken by this project, it would be well to consider significant interrelationships between the two theories. This is necessary in order to resolve the conflicts between the theories advocated by the two psychologists as they affect application and attainment of geographic concepts and generalizations.

When Bruner speaks about the child's grasping the fundamental ideas or the structure of a given discipline, he refers to the child's perceiving meaningful relationships; structure, in Bruner's terms, is learning how things are related. In the development of logical reasoning, Piaget has described the stage of concrete operations as one where the child can perceive relations of cause, consequence or logical justification. This he contends takes place after the child is seven to eight years old.

Bruner speaks of inductive and intuitive thought processes as means of attaining structure. When he speaks of the essence of structure as the attainment of meaningful relationships, it can be assumed that he is speaking of the attainment of cause and effect or logical relationships. Piaget has described reasoning in the stage of concrete operations, ages seven to ten, as one where the child can perceive causal or logical relations from the concrete activities or experiences which he encounters.

It would appear, therefore, that the attainment of the structure of a discipline for primary grade children calls for the understanding of causal or logical relations. The child in Piaget's stage of concrete operations has been able to perform this type of reasoning. Therefore, the attainment of meaningful relationships or structure in the early years of the child's school experience, as proposed by Bruner, is supported by the empirical findings and theoretical postulations of Piaget.

Methods of Instruction

Discovery learning.--Discovery learning has characterized recent curriculum innovations in elementary education. Its popularity stems primarily from the fact that it is a reaction against the rote type of verbal reception learning which has characterized the traditional teaching of some subjects, particularly science and social studies at the elementarv level. The popularity of the discovery approach is perhaps due to its close alliance with the "structure theory" of curriculum development.

Discovery and inquiry are terms often used interchangeably. However, they cover a wide range of approaches from autonomous discovery to guided discovery and include a consideration of non-verbal awareness. Suchman (1962), in his interesting study of scientific inquiry training, makes a distinction between discovery and inquiry. He defines inquiry as a conscious act of search and information processing in order to determine causal relationships; discovery, according to Suchman, is the act by which one suddenly becomes aware of causal relationships and, therefore, would be the result of inquiry oriented behavior on the part of the learner. Suchman indicates that discovery is inferred from the verbal response behavior of the individual.

A study by Gagné and Smith (1965) found that subjects who were required to verbalize during practice did significantly better than those who were not required to do so. They further state that requiring verbalization had the effect of forcing subjects to think of reasons for their actions and resulted in the facilitation of the discovery of principles and their use in the subsequent solving of problems.

Studies by Kittell (1957), Kersh (1958) and Gagné and Brown (1961) all indicate that the guided discovery approach is superior to the discovery approach alone. This type of "contrived discovery" appears to have great relevancy for the elementary school pupil. Ausubel (1963) contends that before a child can discover concepts and generalizations efficiently the problem must be structured for him, the materials and procedures for handling data arranged for him, and the learning situation organized in such a way that the ultimate discovery of the concept or generalization is almost inevitable.

Ausubel, who has been an articulate critic of the indiscriminate use of the discovery approach to learning, has indicated that it is a valuable experience for elementary school pupils.

> The discovery method can be used most effectively when the learner is in the concrete stage of logical operations and is dependent both on concrete empirical props and on a preliminary phase of intuitive, subverbal insights for the learning of complex abstractions (Ausubel, 1961, p. 54).

Ausubel also points out that elementary teachers can facilitate the process of discovery and at the same time overcome the disadvantage of the time-consuming process of discovery, by the judicious use of prompts and hints. Ausubel indicates that discovery learning utilized beyond the elementary school level is an inefficient use of pupil time.

Verbal Reception Learning.--Ausubel (1965) describes verbal reception learning as the process in which the entire content of the subject matter under consideration is presented to the learner in final or organized form. The role of the pupil is to internalize the content presented so that it may become functional at a future time.

Ausubel (1965) proposes that the meaning implies that one has subsumed material into a cognitive structure. It further implies equivalence between the verbal expression and the mental content which it represents. For learning to be meaningful, the learner must, according to Ausubel, employ a meaningful learning set and the material must be potentially meaningful to him.

Potential meaning, for Ausubel, means that there is a non-arbitrary relationship between elements in the material itself and that there exists a relationship between the relevant concepts and the cognitive structure within the individual. He dismisses the learning of nonsense syllables and paired associated as being arbitrary relationships and not potentially meaningful.

For the elementary child to be able to attain abstract meanings or concepts there must first be a presentation of an adequate background of concrete-empirical experience.

Ausubel vigorously denies the claim that verbal reception learning is either passive or rote. He distinguished between meaningful and rote learning when he states that the learner's set in rote learning is to internalize verbatim material as a discrete end in itself. Ausubel points out that rote verbal learning is related to cognitive structure but not in a substantive non-arbitrary fashion which permits the attainment of relationships among previously subsumed materials; therefore, the relationships previously described in potentially meaningful material are not present.

Ausubel (1963) warns that if directly presented verbal materials, during the elementary school years, are divorced from empirical experience or far removed from them, the likelihood of meaningful incorporation into the cognitive structure is remote and the result would be rote learnings unrelateable to cognitive structure in a potentially meaningful way.

Intuitive Learning.--Bruner (1960) indicates that there is little systematic knowledge about intuitive thinking or the variables which affect its development. An understanding of intuitive thinking is perhaps best achieved, according to Bruner, by contrasting it with analytic thinking. Analytic thinking proceeds on the basis of well defined steps to a conclusion whereas intuitive thinking does not. The intuitive thinker uses short cuts to the solution of problems without awareness of exactly how the solution was reached. Once solutions have been attained by an "intuitive leap", then the more analytic processes can be used to verify or nullify the conclusion.

Bruner (1960) believes that knowledge of the structure of a field of knowledge facilitates the use and development of intuitive thinking. When one is familiar with the structure or the relatedness of the various aspects within a discipline, Bruner proposes that intuition may consist of using a limited number of cues. Bruner further indicates that self-confidence on the part of the individual and a tolerance for hypothesizing or guessing on the part of the teacher may encourage the development and use of intuitive thinking. Intuitive thinking requires that the learner be willing to take the risk of making mistakes and, therefore, he must have confidence in himself or he may be unwilling to take such risks. Bruner raises the question as to whether the system of rewards and punishment generally used in schools may actually impede the development or the desire on the part of the pupil to think intuitively. If pupils are rewarded when they give the "right" answer and reproved when they hypothesize or make intuitive leaps, then the promotion of intuitive behavior may be seriously impeded.

Wallach (1961) has proposed that intuitive thinking parallels inductive thinking with the difference being that intuitive thinking stems from a limited number of cues. Where inductive thinking would proceed systematically from perceived data to a conclusion derived from the analysis of relationships among the data, Wallach contends that intuitive thinking is less systematic and proceeds with the use of a limited number of cues.

PROCEDURE

Research Design

The primary concern of this project was to determine if primary grade pupils in a culturally advantaged community were able to understand and apply selected concepts and generalizations in geography. Therefore, the ultimate criterion was the performance on an instrument designed to measure the pupils' ability to understand and apply the concepts and generalizations which they had studied. The results of this measure constituted the dependent variable in the research design employed by this study. The independent variables specified the characteristics to be tested in the study.

The main independent variables were the treatment variables or the three approaches to instruction and the control status. The concomitant independent variables were grade level and sex.

The general design of the experiment was patterned after the Pretest-Posttest Control Group Design described by Campbell and Stanley (1963). This design calls for the random selection of groups with the application of pretests and posttests to all groups. The experimental groups received the treatment variable while the control group received none. A schematic representation of the design follows:

Schematic Representation of Pretest-Posttest Control Group Design

R O_1 X O_2 R = Random selection of groups

R O_3 O_4 O = Testing results

X = Treatment variable

Educational and psychological researchers point out that it is generally difficult, if not impossible, to use randomly selected groups. In most cases, intact groups, in the form of existing classes, must be used. Allowances for the lack of comparability among the groups must be accounted for in the compilation and interpretation of the results. McNemar (1962) states that the best means of making allowances for the uncontrolled differences among groups is through statistical control. The statistical control used in this study was the analysis of covariance which adjusted the posttest scores on the basis of pretest and intelligence test scores. Equalization of the groups on this basis approximates the randomization called for by the Pretest-Posttest Control Group Design.

Three instructional approaches or treatment variables were used to determine which of them were most appropriate for primary grade children. Grade level and sex were included as independent variables. Grade level was selected in order to determine if there was a particular level within the primary grades that would be most appropriate to begin a program designed to bring about the understanding and application of the selected concepts and generalizations in geography; sex was included to determine if there was a significant difference between the ability of boys and girls in the primary grades to understand and apply the selected concepts and generalizations in geography.

By the use of the analysis of covariance, all groups were placed on an equal basis in reference to pretest and intelligence test scores as they influenced performance on the posttest or criterion scores. Pretest scores were used as a covariate because it was assumed that variability in cultural experiences in the home, travel experiences, and the like would be reflected in this score. Intelligence test scores were used as a covariate because of their possible influence on criterion scores.

Selection of Population and Sample

The population for the study consisted of the primary grades in the Weston Public Schools, Weston, Massachusetts. A stratified random sample was drawn from the population of twenty-seven primary grade classes. Each primary grade class in the Weston Public Schools was assigned a number. The Table of Random Numbers was entered and the first four classes drawn for each grade level constituted the sample for the study. Having drawn the sample, the four classes at each grade level were pooled and drawn again by the use of the Table of Random Numbers to determine the particular instructional approach or control status. The first class selected at each grade level during the second drawing was designated as inductive, the second as deductive, the third as intuitive and the fourth as control.

The Town of Weston has a population of about nine thousand. It is considered to be a well-to-do suburb. The town is almost entirely residential and has a rigorous zoning code. The community is largely composed of business and professional men and their families. Many staff members from Boston's numerous educational institutions reside in Weston. Weston's residents have a high interest in and high expectations for their schools.

The following data from the 1960 U. S. Census characterize the conditions of the community in which this study took place. The median income for families in Weston was $13,703 as compared to $6,687 for the Metropolitan Boston Area. The median number of school years completed by adults was 14.8 for Weston residents as compared to 12.1 for the Metropolitan Boston area. The per pupil expenditure in terms of net average membership was $517.82 for Weston as compared to the state average of $331.64.

Seventy-two percent of Weston's residents are classified as white-collar workers. Seventy percent of Weston's families have an income of $10,000 or more. The percentage of families in the $15,000 and over income bracket (43.8%) is higher in Weston than in any other community in the Metropolitan Boston Area. Therefore, for the purposes of this study, Weston is considered to be a culturally advantaged community and the subjects selected for study are termed culturally advantaged primary grade pupils.

Selected Concepts and Generalizations in Geography Utilized in the Study

The concepts and generalizations used in this study were selected from the work of Dooley (1957). Dooley compiled a list of over two hundred concepts from major textbooks in geography for grades one to twelve. She then submitted these concepts for content validation to a jury composed of seven professors of geography, eight professors of social studies in teacher training institutions, and eight professional geographers. The jurors rated each of the concepts on the basis of accuracy, importance and learnability. Concepts were rated either as accurate or inaccurate. Concepts were also rated as being not very important, fairly important or very important. They were then designated by jurors to be most appropriate for the elementary or secondary schools.

The purpose of Dooley's study was to provide a validated list of concepts which could serve as the basis for curriculum development in geography. This study utilized twelve of the concepts validated by Dooley in order to provide content validity for the development of the criterion instrument and to assist the development of the instructional procedures. Therefore, the lesson guides and criterion instrument have derived their content validity from Dooley's work.

The two physical geographic regions selected for study were the desert and the tropical rainforest. The particular concepts and generalizations selected from Dooley's work were chosen for the following reasons: (1) they dealt with environments which differed considerably from the immediate environment of the primary grade subjects involved in the study; (2) they dealt with physical geographic regions in direct contrast with one another; (3) the contrast of the physical geographic regions would tend to reinforce the attainment of the concepts and generalizations for each region; (4) the regions selected would be of great interest to primary grade children.

The twelve concepts and generalizations selected from Dooley's work were as follows:

Concepts and Generalizations relating to the Desert:

D1 Tremendous changes of temperature occur in each twenty-four hour period in desert areas because the barren land is not protected by vegetation or cloud cover and there is relatively little water vapor in the air. Heat absorbed in sun hours is radiated unimpeded in the night hours.

D2 A desert is often defined as an area of less than 10 inches of annual precipitation (less in cool areas) and where the evaporation may exceed the precipitation.

D3 Plants and animals that survive in a desert adjust their requirements to the extreme heat and low amount of moisture. Some adjust desert environments to their requirements.

D4 Some deserts have vast areas of dunes which hinder transportation.

D5 Oases are places within desert areas where water is obtainable.

D6 Deserts as a whole are sparsely inhabited except where there are deposits of commercially valuable material or unless sufficient water is available for irrigation as in Egypt.

Concepts and Generalizations relating to the Tropical Rainforest:

J1 The equatorial calm belt is found near the heat equator where temperature and humidity are constantly high and where precipitation occurs almost daily.

J2 In the equatorial calm belt heated air rises and cools and precipitation occurs often in the mid-afternoon.

J3 Tropical rainforests are found near the equator.

J4 Sparseness of ground vegetation in the tropical rainforest is due to the absence of sunlight caused by close spacing of tree crowns.

J_5 The native animals of the tropical rainforest include birds, monkeys, and snakes.

J_6 Jungle growth occurs near river banks, where sunlight penetrates to the ground. However, a jungle is any tract covered with dense and tangled vegetation.

The concepts and generalizations stated by Dooley were translated directly into learning experiences for pupils and the criterion instrument as they were stated with the exception of one. Dooley's concept forty, J_1 in this study, was changed slightly because it was felt that the introduction of the concept of "heat equator" would be too difficult for primary grade pupils and would tend to confuse pupils in their attempt to attain the concepts relating to the equator and the equatorial calm belt. Thus, Dooley's concept was restated leaving out the concept of heat equator and it reads as follows:

J_1 The equatorial calm belt is found near the equator where temperature and humidity are constantly high and where precipitation occurs almost daily.

While this restatement does negate the concept of the heat equator, it served the purpose of clarifying and reinforcing concepts J_2 and J_3. The validity of the restated concept is assumed to be retained; as restated, it assisted in the attainment of the outcomes specified for this aspect of the study.

Development of the Criterion Instrument of Understanding and Application

The criterion instrument of understanding and application has been defined as the dependent variable in this study. The instrument was constructed to measure the ability of the subjects to understand and apply the concepts and generalizations selected for the study from the list validated by Dooley.

This study accepted Bloom's (1956) definition of understanding and application. Items on the criterion instrument to measure understanding were constructed so that the pupil had to demonstrate that he perceived the relationships between or among the major elements included in the concept or generalization. Items to measure application were fictional items which required the pupil to apply appropriate abstractions of which he had presumably attained understanding.

It was determined that the same instrument would be used for both the pretest and posttest. This decision was based on the fact that the type of test used was quite different from those encountered by primary grade children. Studies of this type generally do not require the development of alternate forms of a test.

Items on the criterion instrument were first constructed to measure the understanding of the concepts and generalizations selected for the study. Each of Dooley's concepts and generalizations was translated into an item which required the pupil to determine the logical or causal relationships which existed among the various elements of the concept or generalization. Following the construction of items to measure understanding of the twelve concepts and generalizations, items were constructed to measure the ability of the pupils to apply these abstractions in novel situations. The items measuring application often called for the pupil to apply several appropriate abstractions to one novel situation (see Appendix C).

For ease of classification, the test items relating to concepts and generalizations about the desert were labeled D_1 to D_6. Correspondingly, the items relating to the tropical rainforest were labeled J_1 to J_6; J in this instance was used to represent the jungle, a part of the tropical rainforest.

Table 1 summarizes and notes the particular test items designed to measure understanding and application of the selected concepts and generalizations in geography.

Nineteen test items were constructed as multiple response items with five alternatives; the number of correct alternatives ranged from one to four. Three items had only two alternatives. The test items were sometimes grouped so that two or more items were derived from the same stem. The last four test items, eighteen to twenty-two, for example, were generated from the same stem.

Three of the items were developed so that the student had to select one of two alternatives as being correct and then substantiate the answer to this question by choosing the correct alternatives in the following question (see questions 3 and 4, 5 and 6, Appendix C).

The number of correct responses on the criterion instrument was fifty-two; the incorrect responses amounted to forty-nine. Thus, there were 101 response items from which pupils were to choose the correct answers. The correct responses were designed so that they were distributed evenly over the possible response positions; there were ten correct responses in the positions A, B, D, E, with twelve correct responses in position C.

In order that the test would not discriminate against those primary grade pupils who may experience reading difficulties, the administration of the test was accomplished by means of a tape recording. A former first grade teacher developed the test administration, using her judgment as to the pacing of the test and the necessity to include encouraging remarks for first graders. Another reason for the development of the taped administration was to standardize the testing procedure from the point of view of presentation of the items and the time involved. It was hoped that the use of the tape recording would make the experience an easier one for first grade pupils who have not been exposed to extensive formal testing.

Selection of Instructional Materials

Films and filmstrips were procured from major commercial producers of educational films and from private firms and government agencies. The films and filmstrips selected for screening ranged from those designed for intermediate grade pupils to secondary school pupils and adult audiences. A total of thirty films and forty-eight filmstrips were screened for possible use in the study. Fourteen films and thirty filmstrips were finally selected for use (See Appendix B).

A series of approximately seventy-five pictures of desert scenes and twenty-five of the tropical rainforest, selected from pictorial magazines, were mounted and made available to the classes on a rotating basis. These were not used for formal instructional procedures, but were available for pupils to view at their leisure. One series of commercially prepared pictures was made available and this set was used in formal instruction.

Books relating to the desert and the tropical rainforest were selected and screened from lists provided for elementary school libraries. A selection of approximately thirty titles, in multiple copies, was made available to the experimental classes on a rotating basis. The books were available for students to use but they were not used as formal means of instruction. Twenty-five individual student atlases were provided for each class for pupil reference use. Simplified individual maps were prepared for pupils which dealt with specific aspects of the concepts and generalizations selected for study and were used for specific instructional purposes.

Development of Learning Experiences

A series of twenty lesson guides for each of the three instructional approaches was developed to assist pupils to attain the concepts and generalizations selected for the study. Eleven lesson guides were required to present adequately the concepts and generalizations on the desert, while nine were sufficient to present those on the tropical rainforest for each instructional approach. The series of lessons was prepared for a four-week period.

The lessons were constructed to implement the inductive, deductive or intuitive approach; the content of each lesson was based on particular films or filmstrips and the concepts and generalizations to which they referred. In most cases, the films or filmstrips dealt with more than one concept. Where appropriate, the use of other visual aids such as pictures and maps were included in the lessons (see Appendix D). Each lesson guide stated the objectives to be achieved, the concepts and generalizations to be attained, materials to be used and an outline of specific procedures to be followed based on the particular instructional approach. The twenty lesson guides for each of the instructional approaches used identical objectives, concepts and generalizations and materials of instruction. The major difference among the guides was in the instructional approach used and the particular characteristics of each which were carefully delineated.

The inductive or guided discovery approach was characterized by the teacher acting in the role of a guide for pupils. The teacher was to pose questions for pupils which would lead to the attainment of the concepts and generalizations inherent in the instructional materials. The teacher did not expect the child to use the precise terminology found in the statement of the concept or generalization. Her role was to insure that pupils had sufficient knowledge of the substructural elements of the concepts and generalizations and then ask key questions to lead pupils to a discovery of them. The teacher assisted pupils to restate their findings to bring them to the understanding of the concepts or generalizations, but did not impose the adult language included in the statement of the concept or generalization on these understandings which the pupils had discovered. Very specific questions and directions were supplied in each lesson guide for the teacher. An example from Lesson 1, Inductive, follows (see Appendix D):

4. Use the answers which children give; by use of questioning try to get them to state the causal relationships that are necessary to the understanding of the generalization. Write the generalization in their words on the board. Do not impose adult vocabu-

lary on the pupils. If they seem unable to grasp the generalization, drop the discussion and return to it at a later time.

The deductive approach was described as verbal reception learning. This means that the child was presented the concept or generalization in adult form prior to instruction. The teacher's role was to clarify the meaning of the concept or generalization prior to instruction by substituting words or phrases which would be consistent with the meaning intended. The following generalization will be used as an example:

D_1 Tremendous changes of temperature occur in each twenty-four hour period in desert areas because the barren land is not protected by vegetation or cloud cover and there is relatively little water vapor in the air. Heat absorbed in the sun hours is radiated unimpeded in the night hours.

The generalization listed above was changed, in one experimental class, by means of discussion with pupils to read as follows:

D_1 Great changes in temperature take place from day to night in desert areas because the empty land is not protected from the sun by trees or clouds and there is little moisture in the air. Heat built up during the sun hours escapes from the land very quickly at night.

Once having clarified the meaning of the concepts and generalizations for the pupils, the deductive teacher further clarified the meaning during the lessons and demonstrated the specific application of the concept or generalization as it appeared in the film, filmstrip or other instructional material. The deductive teacher was interested that the pupil could restate the concept or generalization in rather precise terms as it had been presented or modified. The teacher's function was one of deductively applying the concept or generalization and encouraging the children to deductively apply the concept or generalization which had been previously presented to them, to specific instances in the presentation of the instructional materials.

The intuitive approach was an attempt to apply what is known about intuitive thinking to an instructional procedure. The intuitive approach was developed to be similar to the inductive or guided discovery approach. The primary difference between the two approaches was found in the fact that the "intuitive" teacher offered pupils a limited number of cues. The teacher guided pupils, by means of discussion, to insure that they had sufficient understanding of the substructural elements of the concept or generalization under consideration. Once having attained these basic understandings, the teacher posed key questions or problems pertaining to the specific concept or generalization. Without comment, the teacher referred questions asked by pupils to other pupils for answers. The teacher did not place a value on pupil responses to questions so that the "right" answer was not accepted by the group because of teacher sanction. The teacher directed questions to pupils to cue them to the central issue at hand if they strayed from the topic under consideration. The main objective of this approach was to get the child to "leap intuitively" from the data presented to the concept or generalization inherent in the data.

The following sequence of procedures was representative of the attempt to get the pupils to "leap intuitively:"

Lesson 1, Intuitive (See Appendix D)

4. At this point elicit from pupils the information to check to see if they have the requisite understandings of:
    a. great changes in temperature in the desert from day to night.
    b. lack of sufficient vegetation to protect land from hot sun
    c. few, if any, clouds in the sky
    d. little water vapor in the air
5. Allow children to discuss these items. Do not tell them the information if they do not possess it.
6. Ask pupils the question, "Why are there such great changes in temperature in the desert?" Do not place value on pupil responses (e.g., "That's good, Johnny"). Rather say: "What do you think about what Johnny just said, Sue?" Refer questions and answers of pupils to other pupils for discussion.
7. Do not verbalize the concept or generalization under consideration for the children. Do not ask them directly to verbalize it. Be careful not to reward overtly by expression, facial or verbal, a child who should happen to verbalize it. To do so may encourage a child to imitate another child's understanding without necessarily having achieved it himself.

The purpose in allowing pupils to discuss among themselves the key question which would tend toward attainment of the concepts or generalizations was to provide them with evidence of the type of behavior required if they were to attain intuitively the concept or generalization.

Orientation of Teachers

The first step in planning the orientation for teachers was the development of a handbook. The handbook was composed of three sections. The first section presented general background information, including a justification for the study, the specific concepts and generalizations to be dealt with, a description of the three instructional approaches to be used and a specification of instructional materials.

An integral part of the second section of the handbook was a review of each of the films and filmstrips to be used as they were grouped for each lesson. In addition to a summary of the content, directions for the use of each were given. Also included in this section were maps and diagrams used in the study.

The third and most important section of the handbook included the twenty lesson guides for each instructional approach for the development of the experiment. Each lesson gave the teacher a stated objective, specified the concepts and generalizations to be presented, listed the necessary materials, and gave a step by step procedure to be followed. The procedures were designed specifically with questions to be asked which were in keeping with the instructional approach used.

The first orientation meeting for all of the teachers was organized so that all of the materials which were included in the teachers handbook were reviewed. Particular stress was placed on the characteristics of the instructional approaches and the directions for administering the criterion instrument as a pretest and posttest.

Subsequent orientation meetings were held with each group of teachers using the same instructional approach at the three grade levels. In these sessions, the stress was placed on the characteristics of each of the instructional approaches. Each lesson was examined from the point of view of procedure, materials and expected outcomes.

The Conduct of the Experiment

The pretest was administered two weeks prior to the beginning of the experiment. Since the same instrument was used for the posttest, it was determined that an interval of six weeks would be desirable. Intelligence tests were also administered prior to the instructional proceedings. The posttest was administered two days after the completion of the experiment.

The teachers proceeded according to schedules and lesson guides. They were instructed to follow the lesson guides very carefully. If necessary, they were allowed to add additional questions which were in keeping with the particular approach which they used. For the most part, the teachers found this to be unnecessary.

Collection of Data

The primary data source for the evaluation of the study was derived from the criterion instrument. This constituted the evidence as to whether the pupils had attained understanding and application of the concepts and generalizations selected for the study. The data from the posttest were used in the statistical analyses to determine if significant differences occurred between the three instructional approaches and control status, the grade levels, sex, or interactions among these major effects. Parent questionnaires, teacher questionnaires and interviews with teachers comprised descriptive data for use in interpreting the outcomes of the study.

A questionnaire was prepared for teachers to sample their reaction to the experiment, the particular instructional approach used, the use of the films and filmstrips and the general appropriateness of this type of approach to social studies for primary grade children. Each teacher was interviewed to get a more complete sampling of her attitudes and the reaction of her pupils to the study. The interviews were recorded and the transcripts were analyzed along with the questionnaires. These interviews took place immediately following the application of the posttest and prior to the scoring of them.

A questionnaire was sent to the parents of the children involved in the study to determine if any of the pupils had actually lived in areas defined as deserts or tropical rainforests. Information was also gathered on experiences of pupils in attending lectures or visiting with people who had lived in any of these areas. Information on the types of magazines or books in the home which might relate to these areas was also gathered. It was felt that information derived from this questionnaire might assist in the overall evaluation of the study.

Organization of Data for Processing

The scores of pupils on the criterion instrument constituted the primary evidence to be used in the evaluation of the study. Specifically, the scores on the posttest constituted the dependent variable, while intelligence test scores and pretest scores were used as covariates or adjustors in the analysis of data. The main effects to be tested were (1) the treatment variables, the three approaches to instruction, and control status, (2) the grade level, and (3) sex.

A total of three hundred three pupils were involved in the experimental and control groups. To facilitate the data processing, it was decided to equate the number of pupils in each cell of the design.

Each of the twenty-four cells varied in the number of pupils. The least number in any cell was nine and the highest number, fourteen. It was decided to randomly delete members from each cell to attain a common membership of nine in each cell. Subjects were first deleted who had been absent when the posttest was administered; following this, each fourth member of a cell was deleted until the desired number was attained. This reduced the sample size from three hundred three to two hundred sixteen; there were seventy-two subjects at each grade level. Each cell was then computed to attain the mean score on the dependent variable covariance adjusted for pretest and intelligence test scores.

In the organization and analysis of data, a distinction was made between scores for understanding, application and total scores which corresponded with the items on the criterion instrument. The understanding and application scores specifically designated the objectives for the study and the total scores were included to determine the overall effect.

Intelligence test scores were derived from the Kuhlmann-Anderson Intelligence Test, Form B, 1963 edition. These scores were used as covariance adjustors in the statistical treatment so that all groups were equated on this factor as it influenced performance on the posttest or criterion score. The pretest scores, derived from the same instrument, were used as covariate adjustors so that all groups were equated on this basis of the pretest scores as they influenced performance on the posttest scores. As with the posttest scores, the pretest scores were broken down into scores of understanding, application and total.

In order to determine the reliability of the criterion instrument, the Spearman-Brown split-half coefficient of reliability was used. The correct responses for the items measuring understanding were split into odd and even categories; the same procedure was followed with the scores for application and for total scores. Scores for each of the subjects in each category were attained. This procedure provided for the subdivision of the criterion instrument into two half-length tests of assumed equivalence; the coefficient of reliability was then estimated by the use of the Spearman-Brown formula (Thorndike, 1951).

Analysis of Data

The basic design for the testing of the hypotheses for the study was attained by the use of the Groups, Within-Treatments Design. The design is predicated upon the following conditions outlined by Lindquist (1953):

1. The distribution of the criterion measures for each subpopulation is normal.

2. The variance of this distribution is the same for all subpopulations.

3. The group taken from each subpopulation is a random sample from that subpopulation.

4. Within each treatment set, the subpopulation means are the same.

The fourth assumption or condition constitutes the hypotheses to be tested in the analysis of data. Lindquist points out that conditions one to three are generally satisfied in most experiments closely enough so that the F distribution is essentially unaffected. Therefore, a significant F indicates that the fourth condition is false and that some real differences exist among the subpopulations in one or more of the treatments.

Campbell and Stanley (1963) state that when an experiment utilizes both a pretest and posttest score, it is preferable to use the analysis of covariance with the pretest scores used as a covariate, rather than the use of simple gain score comparisons. Lindquist (1953) indicates that the use of the analysis of covariance secures the same precision in the evaluation of the treatment effects as if the uncontrolled variables were controlled prior to the experiment by the matching of groups.

This study designated pretest scores and intelligence test scores as the covariates. Pretest scores were used because it was assumed that cultural experiences of travel, the availability of books, other visual or verbal experiences, and previously related school experiences would be reflected in the pretest scores. Thus, the analysis of covariance equated all pupils on the basis of these pretest scores as they influenced performance on the dependent variable. Intelligence test scores were also used as a covariate so that all pupils would be equated on this basis as they influenced performance on the criterion score.

The system used for analysis of data was derived from the work of Jones called the CHAIN system. Jones describes the system as follows:

> Basically the system is a binary chain tape on which a number of chain links are written. When this is mounted on a B2 and file protected, these links may be called by the main link binary which is submitted with the data to be analyzed. . . . These cards are read onto tape by a 1401. This tape is then mounted on A2 of a 7090 or 7094 type machine (Jones, 1964).

The data was organized for processing according to the Jones program with the title of "Analysis of Variance and Covariance of Analysis of Variance of Posttest Total, Posttest Understanding and Posttest Application."

The main effects and interactions tested were as follows:

Main effects:	Grade level, Treatments, Sex
Interactions:	Grade level x Treatments; Grade level x Sex; Treatments x Sex; Grade level x Treatments x Sex

ANALYSES OF THE DATA AND FINDINGS

Statistical Data

The analysis was performed on scores for the posttest total and the subdivision of the posttest total scores into posttest understanding and posttest application. Tables 2 through 4 summarize the data from the analysis of variance tests.

The data presented in Table 2 indicate that significant differences exist, beyond the one percent level of confidence, between grade levels, between treatments, and between sex. There are no significant differences among the interactions of grades x treatment, grades x sex, treatments x sex or grades x treatments x sex.

Table 3 presents the analysis of variance for the posttest understanding scores, a subdivision of the posttest total scores. The analysis of posttest understanding scores yield significant differences, beyond the one percent level of confidence, between grade levels, between treatments and between sex. There are no significant differences among the interactions of grades x treatments, grades x sex, treatments x sex or grades x treatments x sex.

Table 4 presents the analysis of variance for the posttest application scores, a second subdivision of the posttest total scores. The results are once again similar to the two previous analyses. Significant differences exist between grade levels and between treatments beyond the one percent level of confidence. However, the significant difference between sex is beyond the five percent level of confidence. Similar to the analyses of posttest total and posttest understanding, there are no significant differences among the various interactions of grades x treatments, grades x sex, treatments x sex, or grades x treatments x sex in the analysis of posttest application.

The fact that there are no significant differences among the various interactions indicates that there are no particular combinations of grade level, treatments, and sex which are worthy of further investigation.

Based on the analyses presented in Tables 2, 3 and 4, the null hypotheses established for the study are disposed of in the manner summarized in Table 5.

Since the analyses of variance for the posttest total, posttest understanding and posttest application indicate that there are significant differences among the main effects of grade level, treatment variables, and sex, it is necessary to locate precisely where these differences do exist. The critical difference formula, described by Lindquist (1953, p. 93), was used to determine the significance of difference between the means which were covariance adjusted for pretest and intelligence test scores. The critical difference, at a given level of confidence, yields the value which an observed difference must equal or exceed in order to be significant. Any value which is less than a given d value, for a specific level of confidence, would indicate that the observed difference is not significant.

The data used to determine the significance of difference between means were derived from Tables 6, 7 and 8. These tables give the cell means and the main effect means, covariance adjusted for pretest and intelligence, for posttest total, posttest understanding and posttest application.

Table 9, a summary table, summarizes the main effect means which were used to determine where the significant differences between the means did in fact exist. These values were derived from Tables 6, 7 and 8 for posttest total, posttest understanding and posttest application.

Tables 10, 11 and 12 summarize the tests of significance of differences between the adjusted main effect means of grade level, treatments and sex for posttest total, posttest understanding and posttest application. Each table gives the critical difference (d) for the one and five percent levels of confidence; the differences between the various sets of means for the three main effects are given and the probability of significance is stated.

The analysis of the posttest data presented in table 10 demonstrates that, for the main effect of grade level, significant differences exist between the first and second grades and the first and third grades, but not between the second and third grades. The second and third grades, therefore, differed significantly from the first grade beyond the one percent level of confidence. An inspection of the data in table 10 for the main effect of treatment variable and control status indicates that all three treatment variables differed significantly from the control status beyond the one percent level of confidence. The superiority of the deductive approach was demonstrated in that it differed significantly from the inductive and intuitive approaches as well as from the control status beyond the one percent level of confidence. The difference between the inductive and intuitive approaches was not significant in the analysis of posttest total. For the main effect of sex, the boys differed significantly from the girls beyond the one percent level of confidence.

Table 11 summarizes the tests of significance between means, adjusted for pretest and intelligence, for posttest understanding. The results for the main effect of grade level yield similar findings to those of the posttest total. Both the second and third grade groups differed significantly from, and thus were superior to, the first grade group beyond the one percent level of confidence. The difference between the third and second grade groups was not significant. The results for the main effect of treatment variables yield similar findings to those in the analysis of posttest total. All three treatment variables differed significantly from the control status beyond the one percent level of confidence. The superiority of the deductive approach once again was proved in that it differed significantly from the inductive and intuitive approaches, as well as the control status, beyond the one percent level of confidence. Unlike the analysis of posttest total, the inductive approach did differ significantly from the intuitive approach at the five percent level of confidence, and thus was superior to it. For the main effect of sex, the boys differed significantly from the girls beyond the one percent level of confidence.

Table 12 summarizes the test of significance for the differences between means, adjusted for pretest and intelligence for posttest application. An analysis of the results for the main effect of grade level indicates that the second and third grades once again differed significantly from the first grade group beyond the one percent level of confidence. Unlike the analyses of posttest total and posttest understanding, however, the third grade did prove superior to the second grade in that it was significantly different from the second grade in the analysis of posttest application beyond the five percent level of confidence. The results of the main effect of treatment variable yield similar results to the analysis of posttest total and posttest application. All three treatment groups differed significantly, beyond the one percent level of confidence, from the control status. Since the deductive approach differed significantly from the inductive and intuitive approaches beyond the one percent level of confidence, its superiority is well demonstrated. In a complete reversal from the findings listed in table 11 for posttest understanding, the intuitive approach proved superior to the inductive and differed significantly from it beyond the one percent level of confidence on posttest application. For the main effect of sex, the findings were similar to the other two analyses; the boys differed significantly from the girls beyond the one percent level of confidence.

Reliability Measures for Criterion Instrument

To determine the degree of consistency with which the criterion instrument measured the ability of subjects to understand and apply the selected concepts and generalizations in geography, coefficients of reliability were derived. The total correct responses for the criterion instrument were subdivided into odd and even categories; the same subdivision for scores of understanding and application were also attained. A coefficient of correlation was then attained for each of these pairs of scores. Since the split-half technique yields the correlation for only one-half of the test, it was necessary to estimate the reliability coefficient for the total test; for this purpose, the Spearman-Brown prophecy formula (Thorndike, 1951, p. 580) was used.

Table 13 presents the means, standard deviations, and estimated coefficient of reliability for the posttest total and the subdivision of the total score into posttest understanding and posttest application. It should be pointed out that the data used to determine these particular outcomes were the raw scores for individual pupils on the posttest. These scores were not adjusted for pretest or intelligence test scores as was the case with the major statistical analyses for the study.

The data in table 13 point out that the overall coefficient of correlation for the total test was high; the correlation of .86 demonstrates that the instrument measured the ability of pupils to understand and apply the concepts and generalizations in geography with a high degree of internal consistency. The correlation coefficients for posttest understanding of .78 and posttest application of .83 also yield a reasonably high degree of internal consistency for the criterion instrument as it measured the ability of the pupils to manifest these particular behaviors.

Descriptive Analysis of Statistical Data

The data presented in this section are a descriptive analysis of the statistical data derived from the major analyses for the study presented in tables 6, 7 and 8. The purpose of this section is to present the mean scores for each cell and main effect in the form of percentage scores for the posttest total and for the subdivision of the total score into scores of understanding and application. This will demonstrate the degree to which the subjects were able to understand and apply the selected concepts and generalizations in geography as measured by the criterion instrument.

Tables 14, 15 and 16 present the mean percentage scores on the criterion instrument for each cell and main effect. It will be recalled that the total possible score for the criterion instrument was fifty-two; the division of the total score into two subsections provided a possible score of thirty-two for understanding and twenty for application. The mean percentage scores presented in tables 14, 15 and 16 have been obtained by dividing the mean scores adjusted by pretest and intelligence for each cell and main effect by total possible scores for the criterion instrument or its subdivision. These analyses include only the scores for the experimental or instructional groups; the control group received no instruction and thus is not included.

The data in table 14 point out that the mean percentage score for each cell, with the exception of the inductive and intuitive groups of first grade girls, range from 70 percent to 80 percent. The main effect means for grade level demonstrate that the second and third grade groups achieved a 78 percent score for the criterion instrument as compared to a 71 percent score for the first grade groups. The mean percentage achievement score for the treatment groups reveals that the deductive group achieved an 80 percent score; the inductive and intuitive groups attained a 73 percent score. The mean percentage score for boys was 78 percent while the girls attained a 73 percent score.

Table 15 summarizes the scores for understanding, a subdivision of the total score, as percentages of the total possible score for this category in the criterion instrument. With the exception of three first grade scores, the mean percentage understanding scores for the cells are in the 70 percent range. For the main effect of grade level, the second and third grade groups achieved a 74 percent score, while the first grade groups attained a 69 percent score. An inspection of the main effect of treatments yields a 76 percent score for the deductive groups, 71 percent for the inductive, and 70 percent for the intuitive groups. The boys mean percentage score was 74 percent and the girls was 70 percent.

Table 16 includes the mean percentage scores for posttest application. The results show higher achievement for the items measuring application than for the previous analyses for posttest total or posttest understanding. With the exception of the inductive and intuitive groups of first grade girls, the cell mean percentage scores fall at the upper end of the 70 percent to 80 percent range. The mean grade level percentage scores yield a high of 86 percent for the third grade groups followed by an 83 percent score for second grade groups and a 74 percent score for the first grade groups. The main effect of treatments demonstrates that the deductive group achieved a mean score of 85 percent, the intuitive group 80 percent, and the inductive group 78 percent. The mean percentage score for boys was 83 percent compared to a 78 percent mean score for girls.

Tables 17, 18 and 19 provide descriptive data concerning the sample for the study. Table 17 presents cell means and standard deviations for intelligence test scores. Table 18 identifies the cell means and standard deviations for pretest total scores. Table 19 summarizes the means and standard deviations for intelligence and pretest scores for the main effects of grade level, sex by grade level, and treatment.

It is recalled that pretest and intelligence test scores were used as covariance adjustors in the statistical analysis of the criterion scores. The correlation between intelligence test scores and criterion scores was .30; the correlation between pretest scores and criterion scores was .61.

Interpretation of the Analysis of Mean Percentage Scores

One of the main objectives for the study was to determine if the primary grade pupils in the sample could understand and apply the selected concepts and generalizations in geography. The evaluation of this objective is inextricably interwoven with the statistical analysis by the groups-within-treatments design utilized in the study. The expression of the cell and main effect means expressed as percentages of the possible scores for posttest total, posttest understanding and posttest application, as measured by the criterion instrument, yield descriptive data which assist in the evaluation of this objective. The most meaningful data are the mean percentage scores for the main effect of grade levels. In the analysis of the posttest total, the mean percentage scores of 78 percent for the second and third grade groups yield evidence that these groups were able to achieve a reasonably high degree of understanding and application of the selected concepts and generalizations in geography as measured by the criterion instrument. The mean percentage score of 71 percent achieved by the first grade groups is encouraging particularly when viewed with the descriptive data from teacher questionnaires and interviews.

The difference between the mean percentage scores for understanding and application is interesting. A comparison of the main effect mean percentage scores presented in tables 14, 15 and 16 indicates that pupils performed better on items measuring application than items measuring understanding. Understanding, as defined and developed in the criterion instrument, called for pupils to demonstrate comprehension of the causal or logical relationships necessary to the attainment of concepts and generalizations. Application called for the pupil to apply concepts and generalizations, presumably understood, in novel situations. The results indicate that pupils were able to apply the concepts and generalizations more readily than they could demonstrate attainment of understanding. This phenomenon could be a function of the criterion instrument itself. It is possible that the criterion instrument failed to measure fully the understanding of the concepts and generalizations which pupils had attained. The findings could have been the result of the application items themselves which the pupils may have found more comprehensible than the items measuring understanding.

From the analysis of the mean percentage scores presented in tables 14, 15 and 16, the investigator concludes that the culturally advantaged primary grade pupils involved in the sample for the study demonstrated ability to understand and apply the selected concepts and generalizations in geography. This is particularly true of the second and third grade groups involved in the study. The first grade groups demonstrated an acceptable degree of understanding and application as measured by the criterion instrument.

Interpretation of the Results of the Statistical Analyses

One of the objectives of the study was to determine the most appropriate grade level at which a study of the selected concepts and generalizations could begin. A quick inspection of the analyses would indicate that the second and third grades would be the appropriate levels to initiate a study of this type for the population specified. However, the fact that the first graders who received instruction were able to achieve a score of 71 percent, as measured by the criterion instrument, should not be overlooked. The descriptive data to be presented in a later section of this report may give a different perspective on their performance on the criterion instrument. While the results for the second and third grade groups were significantly different from the first grade groups, one should not totally discount the score achieved by the first graders. The nature of the concepts and generalizations dealt with in the study and the nature of the testing situation and the criterion instrument indicate that the first graders were able to do quite well under the circumstances.

The superiority of the deductive or verbal reception approach to instruction was clearly demonstrated in the analysis of data. This group differed significantly from the other treatment variables and the control status beyond the one percent level of confidence in all analyses. This is not surprising when one considers that verbal reception learning is generally characteristic of most instruction at the elementary school level. It must also be recognized that the inductive and intuitive approaches used in the study were effective means of instruction when compared with the control status. The fact that no significant difference between the inductive and intuitive approaches was found on the analysis of posttest total while significant differences were found in favor of the inductive approach in the analysis of posttest understanding and the intuitive approach in the analysis of posttest application raises many questions.

A recognition of the fact that the intuitive group and the inductive group did not differ from each other in the analysis of posttest total was of considerable interest to the investigator. An a priori assumption by the investigator was that the inductive group would differ significantly from the intuitive approach. This assumption was based on the following facts: (1) Some of the instructional programs at the primary grade level, notably in science and in the new math programs follow an inductive or guided discovery approach; (2) The characteristics of the intuitive approach, as defined in this study and developed in the lesson guides, were radically different for primary grade pupils in terms of the lack of reward structure, and in terms of the lack of "closure" at the end of the lessons. For these reasons, it was assumed that the inductive approach would be superior to the intuitive approach in the analysis of posttest total.

It would be difficult, if not impossible, to account for the significant differences in favor of the inductive approach over the intuitive in the analysis of posttest understanding and for the intuitive approach over the inductive in the analysis of posttest application. This is particularly true in the analysis of the application scores as measured by the criterion instrument. The intuitive approach did not call for the pupils to verbalize the concepts and generalizations at the end of a particular lesson, whereas the inductive approach did. In fact, the intuitive approach only provided the pupils with key questions which would tend toward the attainment of the concepts and generalizations and then allowed them to discuss these among themselves without rewards or sanctions from the teacher. It could be that the nature of the criterion instrument had something to do with the occurrence of this phenomenon. In any event, further investigation would have to be undertaken in order to explain adequately these findings.

The fact that the boys differed significantly from girls in all the analyses was not surprising. Research (Tyler, 1960) indicates that boys generally perform better than girls in work involving abstract relationships. This fact undoubtedly accounts for the superior performance on the part of the boys. The nature of the concepts and generalizations selected for the study, which dealt primarily with the physical aspects of areal homogeneity related to the desert and the tropical rainforest, may have been more interesting to boys and thus had some effect on their superior performance.

The fact that the interactions proved to be statistically not significant indicates that no particular combination of grade level, instructional approach or sex could be identified as differing significantly from others. It was assumed, prior to the study, that a particular instructional approach might prove to be more effective than others with a given grade level or sex. This was not verified in the statistical analyses.

Presentation of Descriptive Data: I

A questionnaire was prepared for the experimental teachers to sample their opinions about the experiment, the materials used for instruction and pupil attainment of the concepts and generalizations. The items used in the questionnaire and the frequency of responses follow:

Questionnaire for Teachers of Experimental Groups with Frequency of Response

1. Do you feel that your pupils were able to understand the concepts and generalizations included in the study?

   a. Yes (9) No (0)
   b. All of them (6) Some of them (3) None of them (0)

2. Do you feel that the posttest will adequately represent the degree of understanding which pupils have of the concepts and generalizations included in the study?

   a. Yes (2) No (2) Not sure (5)

3. Do you feel that the films used for the study were successful in bringing about an understanding of the concepts and generalizations included in the study?

   a. Yes (9) No (0)
   b. Highly successful (3) Generally successful (6) Unsuccessful (0)

4. Do you feel that the filmstrips used for the study were successful in bringing about an understanding of the concepts and generalizations included in the study?

   a. Yes (0) No (0)
   b. Highly successful (4) Generally successful (5) Unsuccessful (0)

5. Would you say that the films or the filmstrips were generally more successful in bringing about an understanding of the concepts and generalizations included in the study?

   a. Films (2) Filmstrips (2) Both films and filmstrips (4) Not sure (1)

6. Do you feel that the instructional approach you used was successful in bringing about an understanding of the concepts and generalizations included in the study?

   a. Yes (9) No (0)
   b. Highly successful (2) Generally successful (7)
      Unsuccessful (0)

7. Do you feel that another instructional approach would have been successful with your pupils?

   a. Yes (6) No (0) Maybe (2) I don't know (1)

8. Do you feel generally that the films and filmstrips were appropriate for viewing by the primary grade children?

   a. Yes (8) No (1)
   b. Highly apprppriate (1) Generally appropriate (8)
      Inappropriate (0)

9. Do you feel that this type of approach to social studies would be generally valuable for primary grade children?

   a. Yes (6) No (0) Possibly (3)
   b. Highly valuable (4) Generally valuable (5)
      Not valuable (0)

Two of the respondents to question one had selected the second alternative in part b of the question, but in doing so they crossed out the word some and inserted the word most.

Summary of Results of Teacher Questionnaire.--A general review of the questionnaire reveals that the teachers were quite sure that pupils had attained most, if not all, of the concepts and generalizations included in the study. The majority of them were unsure about the ability of the post-test to represent adequately the degree of understanding which they felt the pupils had attained. They felt that the films and filmstrips were successful means of instruction but they were divided in their opinions as to which were the most valuable. The teachers stated that other instructional approaches would have been successful with their pupils. They generally felt that the films and filmstrips were appropriate for viewing by primary grade children and they generally agreed that this type of approach to primary grade social studies would be valuable.

Interviews with Teachers of Experimental Groups.--In order to assess more fully the attitude of the nine experimental teachers toward the study, they were interviewed individually or in groups of two. These interviews enabled the investigator to probe more deeply into the answers which the teachers recorded on the questionnaire.

The majority of the teachers were pleased with the study and the learnings which their pupils had acquired. For the most part, they felt that the posttest would not represent the degree of understanding which they felt their pupils had attained; this they indicated was due to the complexity and length of the instrument. The teachers were quite critical of certain aspects of the study. For example, they felt that the lessons were too long and, in many cases, there was too much material crammed into a lesson. They felt quite strongly about the redundancy of the materials; they felt that fewer films and filmstrips could have been used with the same results achieved.

Perhaps the most serious criticism from the teachers was their feeling that the pupils should have been more actively involved in other types of activities rather than just viewing audio-visual materials and discussing them.

The reaction of the teachers to the particular films and filmstrips which were used in the study was interesting. The questionnaire indicated that the teachers were divided in their opinions as to which were more successful. It should be remembered that all of the films and filmstrips were designated by their producers as appropriate for intermediate grades, the secondary school, or adult audiences. For the most part, the films designated for the intermediate grades were the travelogue type of film which were characterized by family living in other lands. The films presented the concepts and generalizations included in this study very generally but did not highlight them. The films which were most appropriate, from the point of view of content, were the biological or ecological type film on the desert and the tropical rainforest designed for secondary school students. While the narration for these films was far above the general vocabulary level of the primary grade pupils, the concepts selected for study were more specifically presented in these films than in any others. The teachers, however, felt that the pupils did learn a great deal from these films. The one lesson which the students and teachers agreed was the most outstanding, from the point of view of interest on the part of the pupils and the content presented was the lesson which included the U. S. Air Force Training Film, "Jungle Survival." The pupils manifested a keen interest in this film and the teachers felt that they learned a great deal from it.

The filmstrips were generally more narrow in the scope of presentation and thus the teachers felt that they were more advantageous in the presentation of the specific concepts and generalizations included in the study. The use of filmstrips also offered the possibility of stopping for discussion on particular frames. However, the teachers agreed that it would be necessary to use both films and filmstrips in future studies.

Seven of the nine teachers expressed uncertainty about the performance of pupils on the criterion instrument as an adequate measure of the understanding which their pupils had attained. The general feeling expressed in the interviews was that the pupils learned much more than the test would demonstrate. If one relates the subjective opinion of the teachers to the results of the criterion instrument as expressed in mean percentage scores for the total test, the 71 percent score attained by first graders and the 78 percent scores of the second and third grade groups may be a low estimate of their ability to understand and apply the selected concepts and generalizations in geography. One must keep in mind that the nature of the criterion instrument was quite different from the usual type of achievement testing found in the primary grades. The administration of the test by a tape recording was also a new experience for pupils. These factors may account for the observed achievement scores for the criterion instrument.

Presentation of Descriptive Data: II

Questionnaire for Parents.--In order to gain information on cultural influences in the home environment which may have influenced performance on the pretest, a questionnaire was sent to parents of the pupils involved in the study. Questions were included to determine if the child had lived in or visited areas classified as desert or tropical rainforest. A question sought to determine if friends or relatives had visited these areas and subsequently talked with the pupils about them. Items assessing the type of books or magazines which may have been available in the home were sought as well as an indication as to whether the child had viewed slides or movies outside of the home which dealt with these two regions. The parents were asked to make comments about the degree of interest which the children had shown at home about the study and they were invited to make additional comments. Table 20 includes the questions and frequency of response for the Parent's Questionnaire. The lack of consistency in the total response for the questionnaire is due to the fact that some parents did not respond to all questions.

If the answer yes was given to any of the questions, the parents were requested to explain or in some cases to list information to help clarify the information gathered.

Five parents stated that they had lived in desert regions. Four of these parents indicated that their children had lived in the southwestern section of our country in regions classified as desert. The one area most frequently mentioned was Arizona. One of the respondents indicated that the family had lived for nine years in Saudi Arabia.

The sixteen respondents who indicated, in question two, that they had taken their child to visit these regions mentioned the deserts of the southwestern United States as the regions visited. One family had lived in the Middle East. Thirty parents indicated that their child had been exposed to travel experiences of relatives and friends; in most of these cases, slides or films of these areas had been shown to the children.

One hundred fifteen parents reported that there are written or pictorial materials in the home which dealt with the desert and tropical rainforest. Most frequently mentioned were the National Geographic Magazine, the Life Nature Library Series, The World We Live In, and encyclopedias of various kinds. Forty-seven parents reported that their children had seen slides or movies outside of the home which dealt with these two regions. The film mentioned most frequently was Walt Disney's "The Living Desert."

While questionnaires were returned from approximately two-thirds of the parents of the children involved in the study, the data reveal that the cultural influences in the home may have had something to do with the relatively high scores on the pretest. The grand mean for the pretest was 30.13. This represents 57 percent of the possible correct items on the criterion instrument. The data lend further evidence to the description of the subjects as culturally advantaged primary grade pupils. Not to be overlooked is the fact that the mean intelligence score for the sample was 120.16 with a standard deviation of 13.5. Undoubtedly, this had a considerable effect on the performance of the pupils on the criterion instrument and during the experiment.

CONCLUSIONS AND RECOMMENDATIONS

A main objective of the study was to determine if culturally advantaged primary grade pupils could understand and apply the selected concepts and generalizations in geography. The analysis of the results in terms of mean percentage scores for the criterion instrument gives evidence that the pupils were able to attain the concepts and generalizations specified for the study. The second and third grade instructional groups achieved a 78 percent mean score on the total posttest; the comparable score for the first grade groups was 71 percent. When the total score was subdivided into score for understanding, the second and third grade groups attained a mean score of 74 percent while the score for the first grade groups was 69 percent. The scores for posttest application demonstrated a mean achievement score of 86 percent for the third grade instructional groups, 83 percent for the second grade groups and 74 percent for the first grade groups. The descriptive data in the form of questionnaires for teachers and interviews with them, give further evidence that the pupils were able to attain the concepts and generalizations specified for the study.

While the results for the second and third grade instructional groups were consistently higher than those for the first grade groups, one should not discount the first grade achievement. The first grade teachers, in particular, felt that the nature of the criterion instrument did not allow their pupils to demonstrate the degree of attainment of the concepts and generalizations which were included in the study. Their general feeling was that their pupils gained much more from the study than the criterion instrument would reveal. On the basis of the data presented, the investigator concludes that the pupils specified in the study demonstrated a satisfactory degree of ability to understand and apply the selected concepts and generalizations in geography.

One could infer from the sample to the population in terms of this major outcome. All primary grade pupils in the Weston, Massachusetts, Public Schools would be capable of demonstrating a satisfactory degree of attainment of the concepts and generalizations which were specified for the study.

One of the major objectives of the study was to determine the most appropriate grade level at which instruction would best be initiated in order to arrive at an attainment of the selected concepts and generalizations. The fact that the second and third grade groups did not differ significantly from each other, except in the analysis of posttest application, indicates that the second grade would be an appropriate level to begin such a study. However, while the statistical analysis of data yields significant differences between the first grade and the second and third grades in terms of performance on the criterion instrument, the gross difference in mean scores was not that great. The mean score for the experimental first grade groups of 36.81 yields a 71 percent score out of the total possible score while the mean score for the experimental groups in the second grade of 40.38 and third grade of 40.64 yield a 78 percent score. If one takes into account the results of the descriptive data from the teachers' questionnaire the indication is that all of the pupils gained more out of the study than the criterion scores may have indicated. In any event, the second and third grades are appropriate grade levels to begin a study of this type, and a reasonable doubt may be raised as to whether this type of study would be totally inappropriate for first grade pupils in the specified population. Further experimentation would be called for to verify this position for first grade pupils.

While it is inappropriate to draw any inferences to populations other than the one specified in the study, a tentative hypothesis might be formed that similar results might emerge with primary grade pupils in other high socio-economic suburban communities with similar mean intelligence scores. Replication would be necessary to verify this hypothesis. Certainly, the replication of the study in other community types would be necessary before any generalizations of this study could be made to the parameter of primary grade pupils.

The statistical analysis of data yielded significant differences in favor of the deductive or verbal reception learning approach over all other instructional approaches. While the inductive and intuitive approaches differed significantly from the control status, they did not differ from each other in the analysis of posttest total. In the case of posttest understanding, the inductive group differed significantly from intuitive and in the analysis of posttest application the intuitive group differed significantly from the inductive group.

One can conclude that the deductive or verbal reception learning approach would be the most effective instructional approach for the population under the particular conditions specified in the study. This approach is direct, efficient and effective. It is direct in that it immediately presents the pupil with the outcomes for his learning and then gives him the opportunity to develop understanding by applying this to concrete instructional materials. It is efficient because it is less time consuming than the guided discovery or intuitive approaches. Its effectiveness, as measured by the criterion instrument, is unquestioned under the conditions specified in the study.

One cannot overlook, however, the benefits which may have accrued from the use of the inductive and intuitive approaches since they did differ significantly from the control status. These approaches may produce desirable attitudes toward learning and they did assist in the attainment of the concepts and generalizations specified, though achievement was not as significant as that for the deductive group. The intuitive approach, which was truly experimental in the development of this study, is certainly worthy of further investigation as an instructional approach since it did produce statistically superior results to the inductive approach in the analysis of posttest application.

One can conclude that the materials used for instructional purposes did aid in the attainment of the specified concepts and generalizations. This, however, does not indicate that the use of other instructional materials would be inappropriate. The films and filmstrips selected as the primary material for the presentation of data to pupils were designated for audiences other than primary grade pupils. This raises many interesting questions since materials for the presentation of specific concepts and generalizations of the type included in this study generally have not been specifically developed for primary grade pupils. Once again, the use of these materials can be inferred only to the population specified for the study and inferences to the other populations would depend upon further verification by replication.

Of considerable interest was the grand mean score of 30.13 attained by the sample on the pretest. While the pretest scores were used as covariate adjustors in analysis of the posttest outcome, one cannot discount the fact that the sample attained a mean pretest score which represented 57 percent of the total possible score for the criterion instrument. This does indicate that the pupils in the sample possessed a considerable amount of knowledge about the two physical geographic regions selected for study prior to formal instruction. This lends considerable validity to the contention that educators tend to underestimate the knowledge, the ability and the interests which the primary grade pupils have of areas other than those generally included for the primary grade social studies program. It also points out a need for further research to ascertain prior knowledge which primary grade pupils may have in other related social studies disciplines. While a tentative hypothesis may be generated to similar community types, further verification regarding this fact would be required.

While no specific inferences can be drawn from the descriptive information derived from the questionnaires and interviews, many interesting data did emerge. The pupils involved in the study manifested a considerable amount of interest and enthusiasm for the study and this may indicate that the type of subject matter employed and the particular approaches used are of considerable value for primary grade pupils in the population. The teachers also felt that the pupils learned a great deal more than would be measured by the criterion instrument. The teachers expressed the opinion that the films and filmstrips were appropriate means of instruction for primary grade children in the sample. This raises some interesting questions about the general use of these media for other social science disciplines for the population described in the study.

In essence, this study could be construed as an attempt to verify Bruner's hypothesis concerning the ability of young children to learn various disciplines. On the basis of the evidence collected, one could conclude that this hypothesis was true as it related to the population, the discipline of geography, and the concepts and generalizations selected from that discipline by this study. While the inferences drawn from this study are limited to the specified population, the results do tend to lend credence to Bruner's hypothesis.

Summary of Conclusions

Based upon an analysis of the statistical and descriptive data gathered in this study, the following conclusions have been derived:

1. The culturally advantaged primary grade pupils specified in the population for the study demonstrated a satisfactory degree of ability to understand and apply selected concepts and generalizations in geography.

2. The second and third grade pupils in the population generally demonstrated equal ability to understand and apply the concepts and generalizations in geography selected for the study. Therefore, the second grade is an appropriate level to begin a study of this type.

3. The results for the first grade pupils in the population give sufficient evidence of their ability to understand and apply the concepts and generalizations in

geography selected for study to warrant further consideration for their inclusion in an instructional program of this type.

4. The superior achievement of boys in the study at all grade levels gives evidence that the specific subject matter and instructional approaches are more effective learning experiences for them than for girls.

5. The three approaches to instruction utilized in the study were effective means of bringing about the understanding and application of the selected concepts and generalizations in geography, when compared to control groups.

6. The deductive or verbal reception learning approach was clearly superior to all other approaches in assisting pupils to understand and apply the selected concepts and generalizations in geography.

7. The culturally advantaged primary grade pupils included in the study gave evidence of a considerable amount of knowledge, prior to instruction, about the two physical geographic regions selected for study.

8. The instructional materials used in the study were effective means of assisting pupils to understand and apply the selected concepts and generalizations in geography.

9. Bruner's hypothesis that "any subject can be taught effectively in some intellectually honest form to any child at any stage of development" is confirmed in this study as it related to : 1) the population of culturally advantaged primary grade children; 2) the discipline of geography; and 3) the specific concepts and generalizations in geography selected for the study.

Recommendations for Further Study

Based on the data collected by this study at the theoretical, statistical and descriptive levels, the following recommendations are made for further study:

1. The study should be replicated in a random sample of similar community types to the one in which the study took place to verify the findings of this study as they might apply to these communities.

2. The study should be replicated in a random sample of other community types to determine if the findings of this study would be applicable and generalizable to the parameter of primary grade pupils.

3. Similar studies should be conducted with the same population specified in the study to determine if other concepts and generalizations within the discipline of geography would produce comparable data.

4. Studies should be conducted with the population specified in the study in other social science disciplines to determine if similar findings would result. Once conducted, these studies should be replicated in similar and different community types to determine if the findings could be generalized.

5. Evaluation instruments for this particular study should be extended to include more than one means of data gathering for statistical analyses. Data gathering on the basis of individual interviews with subjects could be developed and non-parametric statistical analyses might be used.

6. The particular criterion instrument utilized in the study should be revised on the basis of item analysis so that it would be less complicated and less confusing for first grade pupils.

7. In a replication of the study, delayed testing should be introduced, after a considerable time lapse, to determine if particular instructional approaches have greater retention value than others.

8. In a replication of the study, the three instructional approaches should be used with differing achievement groups of high, average and low achievers, within the primary grade levels, to determine if specific instructional approaches are more appropriate for particular achievement levels.

9. In a replication of the study, an attempt might be made to combine features of the inductive and deductive approaches to determine its relative effectiveness in comparison with the single approaches which were employed.

10. Further experimentation should be attempted with the intuitive approach in other social science disciplines to investigate further its value as an instructional approach for elementary school pupils.

11. Films dealing with specific environmental aspects related to this study which were specifically designed for older audiences should present revised sound tracks which would be more appropriate for the language ability of primary grade pupils.

12. In a replication of the study, an attempt should be made to modify the instructional approaches to include more diversified activities in keeping with the general approach for primary grade pupils. Activities in art, music, and the language arts should be included.

13. In a replication of the study, the time period should be extended from the four weeks employed to a longer period of time to determine what effect this may have on the outcomes of the study.

14. Further research is needed to:

a. Clarify the process of and give more precise definition to concept formation or concept attainment as it relates to the social studies program for primary grade pupils.

b. Clarify the process of concept formation or concept attainment as it relates to specific instructional approaches for primary grade children.

c. Attain a better understanding of concept formation or concept attainment as it relates directly to verbal learnings of a substantive nature in the social studies program for primary grade pupils.

d. Determine the amount of knowledge which primary grade pupils have of specific concepts and generalizations in geography prior to instruction.

e. Determine the amount of knowledge which primary grade pupils have of concepts and generalizations from other social science disciplines.

f. Verify Bruner's hypothesis that "any subject can be taught effectively in some intellectually honest form to any child at any stage of development;" this is particularly true of the primary grade child in relation to specific social science disciplines.

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BIBLIOGRAPHY

Ausubel, David P. "Learning by Discovery: Rationale and Mystique," The Bulletin of the National Association of Secondary School Principals, XLV (December, 1961), 18-58.

________. The Psychology of Meaningful Verbal Learning. New York: Greene and Stratton, 1963.

________. "In Defense of Verbal Learning," Readings in the Psychology of Cognition. Edited by Richard C. Anderson and David P. Ausubel. New York: Holt, Rinehart and Winston, 1965, pp. 87-102.

Bacon, Philip. "An Introduction to Geography in the Curriculum," Curriculum Guide for Geographic Education. Edited by Wilhelmina Hill. Norman, Oklahoma: National Council for Geographic Education, 1963, pp. 1-8.

Berelson, Bernard, and Steiner, Gary A. Human Behavior. New York: Harcourt, Brace and World, Inc., 1964.

Bloom, Benjamin (ed.). Taxonomy of Educational Objectives, Handbook I: Cognitive Domain. New York: David McKay Co., Inc., 1956.

Brownell, William A., and Hendrickson, Gordon. "How Children Learn Information, Concepts and Generalizations," Learning and Instruction. Forty-ninth Yearbook of the National Society for the Study of Education, Part I. Edited by Nelson B. Henry. Chicago: University of Chicago Press, 1950, pp. 92-128.

Bruner, Jerome S. "Learning and Thinking," Harvard Educational Review, XXIX (Summer, 1959), 184-192.

________. The Process of Education. Cambridge: Harvard University Press, 1960.

Bruner, Jerome S., Goodnow, Jacqueline J., and Austin, George A. A Study of Thinking. New York: Wylie and Sons, 1956.

Cammorata, Gloria. "New Emphases in Social Studies for the Primary Grades," Social Education, XXVII (February, 1963), 77-80.

Campbell, Donald T., and Stanley, Julian C. "Experimental and Quasi-experimental Designs for Research on Teaching," Handbook of Research on Teaching. Edited by N. L. Gage. Chicago: Rand McNally Co., 1963, pp. 171-246.

Carroll, John B. "Words, Meanings and Concepts," Harvard Educational Review, XXXIV (Spring, 1964), 178-202.

Dooley, M. Louise. "A Compilation and Validation of Basic Geographic Concepts for Inclusion in School Curricula from Grades 1 to 12." Unpublished Ed.D. dissertation, Department of Education, Boston University, 1957.

Educational Services Incorporated. ESI Quarterly Report. Watertown, Massachusetts: Educational Services Incorporated, Summer-Fall, 1964.

Gagné, Robert M., and Brown, Larry T. "Some Factors in the Programming of Conceptual Learning," Journal of Experimental Psychology, LXII (October, 1961), 313-321.

Gagné, Robert M., and Smith, Ernest C., Jr. "A Study of the Effects of Verbalization on Problem-Solving," Readings in the Psychology of Cognition. Edited by Richard C. Anderson and David P. Ausubel. New York: Holt, Rinehart and Winston, 1965, pp. 380-391.

Hanna, Paul R. "The Social Studies Program in the Elementary School of the Twentieth Century," The Social Studies: Curriculum Proposals for the Future. Edited by G. Wesley Sowards. Chicago: Scott, Foresman and Company, 1963, pp. 40-79.

Hanna, Paul R., and Lee, John R. "Content in the Social Studies," Social Studies in Elementary Schools. Thirty-second Yearbook of the National Council for the Social Studies. Edited by John U. Michaelis. Washington, D.C.: National Council for the Social Studies, 1962, pp. 62-88.

Harrison, Sylvia E., and Solomon, Robert J. "Review of Research in the Teaching of the Social Studies: 1960-1963," Social Education, XXVIII (May, 1964), 277-292.

________. "Review of Research in the Teaching of the Social Studies," Social Education, XXIX (May, 1965), 281-290.

Hill, Wilhelmina (ed.). Curriculum Guide for Geographic Education. Norman, Oklahoma: National Council for Geographic Education, 1963.

Inhelder, Barbel, and Piaget, Jean. The Growth of Logical Thinking from Childhood to Adolescence. Translated by Anne Parsons and Stanley Milgram. New York: Basic Books, Inc., 1958.

James, Preston E. (ed.). "Foreword," New Viewpoints in Geography. Twenty-ninth Yearbook of the National Council for the Social Studies. Washington, D.C.: National Council for the Social Studies, 1959a, p. vii-viii.

________. "American Geography at Mid-Century," New Viewpoints in Geography. Twenty-ninth Yearbook of the National Council for the Social Studies. Washington, D.C.: National Council for the Social Studies, 1959b, pp. 10-16.

Johnson, Donald M., and O'Reilly, Charlene A. "Concept Attainment in Children," Journal of Educational Psychology, LV (April, 1964), 71-74.

Jones, Kenneth J. The Multivariate Statistical Analyzer. Cambridge: Harvard Coop, 1964.

Kaltsounis, Theodore. "A Study Concerning Third Graders Knowledge of Social Studies Content Prior to Instruction." Unpublished Ph.D. dissertation, Department of Education, University of Illinois, 1961.

Kersh, Bert Y. "The Adequacy of 'Meaning' as an Explanation for the Superiority of Learning by Independent Discovery," Journal of Educational Psychology, XLIV (October, 1958), 282-292.

Kittell, Jack E. "An Experimental Study of the Effect of External Direction During Learning on Transfer and Retention of Principles," Journal of Educational Psychology, XLVIII (November, 1957), 391-405.

LaDue, Donald C. "Social Studies Interests of Children," Peabody Journal of Education, XL (May, 1963), 345-347.

Lindquist, E.F. Design and Analysis of Experiments in Psychology and Education. Boston: Houghton Mifflin Co., 1953.

Lowry, Betty L. "A Survey of the Knowledge of Social Studies Concepts Possessed by Second Grade Children Previous to the Time These Concepts are Taught in the Social Studies Lessons." Unpublished Ph.D. dissertation, Department of Education, State University of Iowa, 1963.

McAulay, John D. "Social Studies Interests of the Primary Grade Child," Social Education, XXVI (April, 1962a), 199-204.

________. "Some Map Abilities of Second Grade Children," Journal of Geography, XLI (January, 1962b), 3-9.

McKeachie, Wilbert. "Needed Research on Psychological Factors in Learning as Related to the Social Studies," Needed Research in the Teaching of the Social Studies. Edited by Roy A. Price. Washington, D.C.: National Council for the Social Studies, 1964, pp. 79-102.

McNemar, Quinn. Psychological Statistics. 3d ed. New York: John Wiley and Sons, Inc., 1962.

Michaelis, John U. (ed.). "Introduction," Social Studies in Elementary Schools. Thirty-second Yearbook of the National Council for the Social Studies. Washington, D.C.: National Council for the Social Studies, 1962, pp. 1-16.

Mugge, Dorothy J. "Precocity of Today's Young Children: Real or Wishful," Social Education, XXVII (December, 1963), 436-440.

Piaget, Jean. Judgment and Reasoning in the Child. Translated by Marjorie Worden. Patterson, New Jersey: Littlefield, Adams and Co., 1959.

Rushdoony, Haig A. "Achievement in Map Reading: An Experimental Study," The Elementary School Journal, LXIV (1963), 70-75,

Rusnak, Mary. "Introducing Social Studies in the First Grade," Social Education, XXV (October, 1961), 291-292.

Russell, David H. "Higher Mental Processes," Encyclopedia of Educational Research. 3d ed. Edited by Chester W. Harris. New York: The Macmillan Company, 1960, pp. 645-657.

Sabaroff, Rose. "A Framework for Developing Map Skills in Primary Grade Social Studies." Unpublished Ed.D. dissertation, Department of Education, Stanford University, 1958.

Smith, Ronald O., and Cardinell, Charles F. "Challenging the Expanding Environment Theory," Social Education, XXVIII (March, 1964), 141-143.

Spodek, Bernard. "Developing Social Science Concepts in the Kindergarten," Social Education, XXVII (May, 1963), 253-256.

Suchman, J. Richard. The Elementary School Training Program in Scientific Inquiry. Urbana, Illinois: College of Education, University of Illinois, 1962.

Thorndike, Robert L. "Reliability," Educational Measurement. Edited by E. F. Lindquist. Washington, D.C.: American Council on Education, 1951, pp. 560-620.

Tyler, Fred T. "Individual and Sex Differences," Encyclopedia of Educational Research, 3d ed. Edited by Chester W. Harris. New York: The Macmillan Co., 1960, pp. 680-686.

Vinacke, W. Edgar. "Concept Formation in Children of School Ages." Education, LXXIV (May, 1954), 528-529.

Wallach, Michael A. Personal Interview, January 9, 1961.

Warman, Henry J. "Major Concepts in Geography," Curriculum Guide for Geographic Education. Edited by Wilhelmina Hill. Norman, Oklahoma: National Council for Geographic Education, 1963, pp. 9-27.

Woodruff, Asahel D. "The Use of Concepts in Teaching and Learning," Journal of Teacher Education, XV (March, 1964), 81-97.

APPENDIX A

TABLF 1

TEST ITEMS MEASURING UNDERSTANDING AND APPLICATION

Concepts and Generalizations	Understanding--Test Items Numbered	Application--Test Items Numbered
D_1	1	10, 11
D_2	5, 6	10, 11
D_3	2	9
D_4	3, 4	9
D_5	7, 8	9
D_6	7, 8	9
J_1	12	18
J_2	13	18, 19
J_3	14	17, 18
J_4	15	19
J_5	16	21
J_6	13, 20	22

TABLE 2

ANALYSIS OF VARIANCE FOR POSTTEST TOTAL

Source	df	SS	MS	F	P
Between Grades	2	758.50	379.25	13.52	$<.01^a$
Between Treatments	3	2175.46	725.15	25.85	$<.01^a$
Between Sex	1	264.87	264.87	9.44	$<.01^a$
Grades x Treatments	6	264.20	44.03	1.57	..
Grades x Sex	2	41.42	20.71	..	..
Treatments x Sex	3	14.67	4.89	..	..
Grades x Treatments x Sex	6	47.95	7.99	..	..
Within	190	5328.96	28.05		
Total	213	8896.02			

[a] Significant beyond the 1% level of confidence

TABLE 3

ANALYSIS OF VARIANCE FOR POSTTEST UNDERSTANDING

Source	df	SS	MS	F	P
Between Grades	2	185.90	92.95	7.8	<.01[a]
Between Treatments	3	681.16	227.05	19.2	<.01[a]
Between Sex	1	102.53	102.53	8.7	<.01[a]
Grades x Treatments	6	136.03	22.67	1.9	..
Grades x Sex	2	17.98	8.99	..	..
Treatments x Sex	3	22.82	7.61	..	..
Grades x Treatments x Sex	6	19.77	3.30	..	..
Within	190	2235.48	11.77		
Total	213	3401.67			

[a] Significant beyond the 1% level of confidence

TABLE 4

ANALYSIS OF VARIANCE FOR POSTTEST APPLICATION

Source	df	SS	MS	F	P
Between Grades	2	254.97	127.49	15.7	<.01[a]
Between Treatments	3	409.99	136.66	16.8	<.01[a]
Between Sex	1	45.71	45.71	5.6	<.05[b]
Grades x Treatments	6	55.11	9.18	1.1	..
Grades x Sex	2	7.72	3.86	..	..
Treatments x Sex	3	10.55	3.52	..	..
Grades x Treatments x Sex	6	25.16	4.19	..	..
Within	190	1545.11	8.13		
Total	213	2354.33			

[a] Significant beyond the 1% level of confidence.

[b] Significant beyond the 5% level of confidence.

TABLE 5

SUMMARY TABLE: DISPOSITION OF HYPOTHESES;
ANALYSIS OF VARIANCE OF POSTTEST TOTAL,
POSTTEST UNDERSTANDING AND POSTTEST APPLICATION

Hypotheses	Disposition	Level of Confidence
(a) Posttest Total		
1	Reject	1% level
2	Reject	1% level
3	Reject	1% level
4	Accept	
5	Accept	
6	Accept	
7	Accept	
(b) Posttest Understanding		
1	Reject	1% level
2	Reject	1% level
3	Reject	1% level
4	Accept	
5	Accept	
6	Accept	
7	Accept	
(c) Posttest Application		
1	Reject	1% level
2	Reject	1% level
3	Reject	5% level
4	Accept	
5	Accept	
6	Accept	
7	Accept	

TABLE 6

CELL AND MAIN EFFECT MEANS COVARIANCE ADJUSTED BY PRETEST AND INTELLIGENCE FOR POSTTEST TOTAL

Grade Level	Sex	Experimental Treatments and Control Status				Total Grade Level Means	Total Sex Means	
		Ind.[a]	Ded.	Int.	Cont.		Boys	Girls
1	B	37.06	42.17	37.12	28.84	34.60	38.74	36.45
	G	33.01	38.91	32.60	27.10			
2	B	41.57	42.37	39.82	36.35	38.90		
	G	39.13	42.02	37.39	32.53			
3	B	39.46	41.86	41.70	36.61	39.29		
	G	39.21	41.11	40.51	33.89			
Total Treatment Means		38.24	41.41	38.19	32.55			

[a] Ind. = Inductive; Ded. = Deductive; Int. = Intuitive; Cont. = Control.

TABLE 7

CELL AND MAIN EFFECT MEANS COVARIANCE ADJUSTED BY PRETEST AND INTELLIGENCE FOR POSTTEST UNDERSTANDING

Grade Level	Sex	Experimental Treatments and Control Status				Total Grade Level Means	Total Sex Means	
		Ind.	Ded.	Int.	Cont.		Boys	Girls
1	B	22.39	25.65	21.45	17.68	20.70	22.90	21.48
	G	20.17	23.33	19.32	15.57			
2	B	24.16	24.60	24.03	21.37	22.89		
	G	23.50	24.34	21.93	19.20			
3	B	22.68	24.27	24.08	22.47	22.98		
	G	23.80	23.79	22.67	20.12			
Total Treatment Means		22.78	24.33	22.25	19.40			

TABLE 8

CELL AND MAIN EFFECT MEANS COVARIANCE ADJUSTED BY PRETEST AND INTELLIGENCE FOR POSTTEST APPLICATION

Grade Level	Sex	Experimental Treatments and Control Status				Total Grade Level Means	Total Sex Means	
		Ind.	Ded.	Int.	Cont.		Boys	Girls
1	B	14.58	16.52	15.72	10.92	13.74	15.88	14.93
	G	12.75	15.39	13.07	10.94			
2	B	17.45	17.22	16.22	15.37	16.08		
	G	15.79	17.60	15.50	13.48			
3	B	16.92	17.59	17.78	14.22	16.39		
	G	15.68	17.15	17.82	13.98			
Total Treatment Means		15.53	16.91	16.02	13.15			

TABLE 9

SUMMARY TABLE: MAIN EFFECT MEANS COVARIANCE ADJUSTED BY PRETEST AND INTELLIGENCE FOR POSTTEST TOTAL, POSTTEST UNDERSTANDING AND POSTTEST APPLICATION

Main Effects		Posttest Total	Posttest Understanding	Posttest Application
Grade Level	Gr. 1	34.60	20.70	13.74
	Gr. 2	38.90	22.89	16.08
	Gr. 3	39.29	22.98	16.39
Treatments	Ind.	38.24	22.78	15.53
	Ded.	41.41	24.33	16.91
	Int.	38.19	22.25	16.02
	Cont.	32.55	19.40	13.15
Sex	Boys	38.74	22.90	15.88
	Girls	36.45	21.48	14.93

TABLE 10

SUMMARY OF TESTS OF SIGNIFICANCE FOR DIFFERENCES BETWEEN ADJUSTED MEANS FOR POSTTEST TOTAL

Main Effect	d 1%[a]	d 5%[b]	Difference Between Means		P
Grade levels	.72	.55	Gr. 2 - Gr. 1	4.30	<.01[c]
			Gr. 3 - Gr. 1	4.69	<.01[c]
			Gr. 3 - Gr. 2	.39	>.05[d]
Treatments	2.63	1.99	Ind. - Cont.	5.69	<.01[c]
			Ded. - Cont.	8.86	<.01[c]
			Int. - Cont.	5.64	<.01[c]
			Ded. - Ind.	3.17	<.01[c]
			Ind. - Int.	.05	>.05[d]
			Ded. - Int.	3.22	<.01[c]
Sex	.59	.45	Boys - Girls	2.29	<.01[c]

[a] The critical difference value at the 1% level of confidence.

[b] The critical difference value at the 5% level of confidence.

[c] Significant beyond the 1% level of confidence.

[d] Not significant.

TABLE 11

SUMMARY OF TESTS OF SIGNIFICANCE FOR DIFFERENCES BETWEEN ADJUSTED MEANS FOR POSTTEST UNDERSTANDING

Main Effect	d 1%	d 5%	Difference Between Means		P
Grade levels	.47	.35	Gr. 2 - Gr. 1	2.19	<.01[a]
			Gr. 3 - Gr. 1	2.28	<.01[a]
			Gr. 3 - Gr. 2	.09	>.05[b]
Treatments	.54	.41	Ind. - Cont.	3.38	<.01[a]
			Ded. - Cont.	4.93	<.01[a]
			Int. - Cont.	3.10	<.01[a]
			Ded. - Ind.	1.55	<.01[a]
			Ind. - Int.	.53	<.05[c]
			Ded. - Int.	2.08	<.01[a]
Sex	.56	.47	Boys - Girls	1.42	<.01[a]

[a] Significant beyond the 1% level of confidence.

[b] Not significant.

[c] Significant beyond the 5% level of confidence.

TABLE 12

SUMMARY OF TESTS OF SIGNIFICANCE FOR DIFFERENCES BETWEEN ADJUSTED MEANS FOR POSTTEST APPLICATION

Main Effect	d 1%	d 5%	Difference Between Means		P
Grade levels	.39	.30	Gr. 2 - Gr. 1	2.34	<.01[a]
			Gr. 3 - Gr. 1	2.65	<.01[a]
			Gr. 3 - Gr. 2	.31	<.05[b]
Treatments	.45	.34	Ind. - Cont.	2.38	<.01[a]
			Ded. - Cont.	3.76	<.01[a]
			Int. - Cont.	2.87	<.01[a]
			Ded. - Ind.	1.38	<.01[a]
			Int. - Ind.	.49	<.01[a]
			Ded. - Int.	.89	<.01[a]
Sex	.40	.31	Boys - Girls	.95	<.01[a]

[a] Significant beyond the 1% level of confidence.

[b] Significant beyond the 5% level of confidence.

TABLE 13

SUMMARY TABLE: MEAN, STANDARD DEVIATION AND ESTIMATED COEFFICIENT OF RELIABILITY FOR POSTTEST TOTAL, POSTTEST UNDERSTANDING AND POSTTEST APPLICATION

Source	Mean	Standard Deviation	Estimated Coefficient of Reliability[a]
Posttest Total-Odd	19.43	4.30	
Posttest Total-Even	18.03	4.42	.86
Posttest Understanding-Odd	11.45	2.78	
Posttest Understanding-Even	10.63	2.78	.78
Posttest Application-Odd	7.99	1.92	
Posttest Application-Even	7.40	2.14	.83

[a] Derived from the use of the Spearman-Brown Prophecy Formula.

TABLE 14

CELL AND MAIN EFFECT MEANS COVARIANCE ADJUSTED BY PRETEST AND INTELLIGENCE EXPRESSED AS PERCENTAGE OF POSSIBLE SCORE FOR POSTTEST TOTAL

Grade Level	Sex	Experimental Treatments			Mean Grade Level Percentage	Mean Sex Percentage	
		Ind.	Ded.	Int.		Boys	Girls
1	B	71	81	71	71	78	73
	G	63	75	63			
2	B	80	81	77	78		
	G	75	81	72			
3	B	76	81	80	78		
	G	75	79	78			
Mean Treatment Percentage		73	80	73			

TABLE 15

CELL AND MAIN EFFECT MEANS COVARIANCE ADJUSTED BY PRETEST AND INTELLIGENCE EXPRESSED AS PERCENTAGE OF POSSIBLE SCORE FOR POSTTEST UNDERSTANDING

Grade Level	Sex	Experimental Treatments			Mean Grade Level Percentage	Mean Sex Percentage	
		Ind.	Ded.	Int.		Boys	Girls
1	B	70	80	67	69	74	70
	G	63	73	60			
2	B	76	77	75	74		
	G	73	76	69			
3	B	71	76	75	74		
	G	74	74	71			
Mean Treatment Percentage		71	76	70			

TABLE 16

CELL AND MAIN EFFECT MEANS COVARIANCE ADJUSTED BY PRETEST AND INTELLIGENCE EXPRESSED AS PERCENTAGE OF POSSIBLE SCORE FOR POSTTEST APPLICATION

Grade Level	Sex	Experimental Treatments			Mean Grade Level Percentage	Mean Sex Percentage	
		Ind.	Ded.	Int.		Boys	Girls
1	B	73	83	79	74	83	78
	G	64	77	65			
2	B	87	86	81	83		
	G	79	88	78			
3	B	85	88	89	86		
	G	78	86	89			
Mean Treatment Percentage		78	85	80			

TABLE 17

CELL MEANS AND STANDARD DEVIATIONS FOR INTELLIGENCE TEST SCORES USED AS A COVARIATE IN THE ANALYSIS OF CRITERION SCORES

Grade Level	Sex	Experimental Treatments and Control Status							
		Inductive		Deductive		Intuitive		Control	
		$\bar{x}$	σ	$\bar{x}$	σ	$\bar{x}$	σ	$\bar{x}$	σ
1	B	101.78	13.58	113.00	14.41	123.44	9.32	112.56	12.71
	G	116.22	13.17	115.33	12.17	127.67	15.41	114.22	5.73
2	B	123.11	9.05	122.33	7.94	122.22	9.19	113.00	7.93
	G	122.56	12.30	123.11	11.88	129.77	13.70	126.33	9.85
3	B	122.11	13.79	121.56	15.68	120.78	9.98	119.11	12.05
	G	122.89	8.06	123.67	10.76	129.56	6.66	117.56	20.56

TABLE 18

CELL MEANS AND STANDARD DEVIATIONS FOR PRETEST TOTAL SCORES USED AS A COVARIATE IN THE ANALYSIS OF CRITERION SCORES

Grade Level	Sex	Experimental Treatments and Control Status							
		Inductive		Deductive		Intuitive		Control	
		$\bar{x}$	σ	$\bar{x}$	σ	$\bar{x}$	σ	$\bar{x}$	σ
1	B	26.33	12.59	26.44	9.92	31.66	11.12	24.11	12.65
	G	26.78	7.21	21.55	12.80	21.67	8.60	19.67	10.25
2	B	32.78	4.78	29.11	8.86	36.11	2.38	34.89	5.17
	G	32.33	6.65	29.56	4.32	32.55	4.37	33.11	3.93
3	B	35.11	6.51	33.44	5.19	31.56	3.20	32.89	4.41
	G	32.89	2.68	32.44	5.92	34.44	2.63	31.67	4.29

TABLE 19

MAIN EFFECT MEANS AND STANDARD DEVIATIONS FOR INTELLIGENCE AND PRETEST SCORES

		Intelligence		Pretest Total	
		$\bar{x}$	σ	$\bar{x}$	σ
by Grade Level					
Grade 1		115.53	14.35	24.77	11.39
Grade 2		122.81	11.41	32.56	5.82
Grade 3		122.15	13.32	33.06	4.71
by Grade Level and Sex					
Grade 1	Boys	112.69	14.80	27.14	11.95
	Girls	118.36	13.32	22.41	10.28
Grade 2	Boys	120.17	9.68	33.22	6.37
	Girls	125.44	12.36	31.89	5.12
Grade 3	Boys	120.89	13.10	33.25	5.13
	Girls	123.42	13.42	32.86	4.24
by Treatments					
Inductive		118.11	14.14	31.04	8.08
Deductive		119.83	13.06	28.76	9.26
Intuitive		125.57	11.77	31.33	7.82
Control		117.13	13.27	29.39	9.39

TABLE 20

QUESTIONNAIRE FOR PARENTS WITH FREQUENCY OF RESPONSE

Question	Response Yes	 No
1. Has your family and your child ever lived in a region classified as a desert or tropical rainforest?	5	200
2. Has your family and your child ever visited regions classified as desert or tropical rainforest?	16	187
3. Has your child talked about either or both of these regions with friends or relatives who may have lived in or visited these regions?	30	171
4. Are there books or magazines to which your child has been exposed that may have contained pictures or articles on these two regions?	115	90
5. Has your child viewed slides or movies outside of school which may have dealt with either of these two regions?	47	155
6. Has your child talked to you about the lessons which he has experienced in recent weeks on the desert and the tropical rainforest?	121	80

APPENDIX B

CHART I

Concepts and Generalizations Dealt With in the Filmstrips on the Desert

Producer	Number	Title	D_1	D_2	D_3	D_4	D_5	D_6
GROUP A								
EGH*	187-A-1	Desert #1	x					
EGH	187-A-2	Desert #2		x				
EGH	187-A-3	Desert #3		x				
EGH	187-A-4	Desert #4			x			
EGH	187-A-5	Desert #5 Test	x	x	x			
GROUP B								
WD,EB	8281	The Great American Desert		x	x			
McGH	405216	Climate and Man		x				x
McGH	405212	Vegetation and Man		x	x			
GROUP C								
SVE	T435-8	Deserts			x		x	
SVE	A462-2	Plants and Animals of the Desert		x	x			
CF	446	How Animals Live in the Desert	x		x	x		
GROUP D								
WD, EB	8286	Plant Life of the Desert			x			
CF	243	Desert Life Community			x			
EB	8284	Reptiles of the Desert			x			
GROUP E								
McGH	349086	Life in Desert Lands	x	x			x	x
EB	9222	Oases in Libya					x	x
EB	9221	Life Along the Nile						x
CF	183	Life in Egypt						x

*Abbreviations used: EGH, Eye Gate House; WD,EB, Walt Disney, Encyclopedia Britannica; McGH, McGraw-Hill Book Co.; SVE, Society for Visual Education; CF, Curriculum Filmstrips; EB, Encyclopedia Britannica Films.

CHART II

Concepts and Generalizations Dealt With in the Filmstrips on the Tropical Rainforest

Producer	Number	Title	J_1	J_2	J_3	J_4	J_5	J_6
GROUP F								
EGH	187-G-1	Tropical Rainforest #1	x	x				
EGH	187-G-2	Tropical Rainforest #2		x				
EGH	187-G-3	Tropical Rainforest #3		x				
EGH	187-G-4	Tropical Rainforest #4		x				x
EGH	187-G-5	Tropical Rainforest #5				x		
EGH	187-G-6	Tropical Rainforest #6 Test	x	x		x		
GROUP G								
McGH	405216	Climate and Man	x		x			
McGH	405212	Vegetation and Man	x		x	x		
EB,WD	8971	Land of the Tropical Forests			x	x	x	x
GROUP H								
EB,WD	8975	Birds of the Tropical Forests					x	
EB,WD	8976	Reptiles and Amphibians of the Tropical Forests					x	
EB,WD	8973	Monkeys of the Tropical Forests					x	
GROUP I								
CF	191	Amazon Village						x
CF	192	The Story of Rubber						x

CHART III

Concepts and Generalizations Dealt with in the Films on the Desert

Producer	Title	D_1	D_2	D_3	D_4	D_5	D_6
GROUP J							
Coronet	Life in Hot, Dry Lands		x	x	x	x	x
GROUP K							
EB	Egypt and the Nile				x	x	x
GROUP L							
Coronet	Life in an Oasis				x	x	x
EB	The Desert	x	x	x	x	x	x
GROUP M							
EB	Life in the Sahara				x	x	x
Marathon	Libya Ahead				x	x	x
GROUP N							
U.S. Dept. of Interior	Water in the West		x				x

CHART IV

Concepts and Generalizations Dealt With in the Films on the Tropical Rainforest

Producer	Title	J_1	J_2	J_3	J_4	J_5	J_6
GROUP O							
Coronet	Life in Hot Rain Forests				x		x
EB	Animals of the Indian Jungle			x	x		
GROUP P							
Coronet	Life in Hot, Wet Lands	x	x	x			x
EB	The Tropical Rainforest			x	x	x	
GROUP Q							
Air Force	Jungle Survival			x	x	x	x
GROUP R							
EB	The Water Cycle	x	x				

A.

APPENDIX C

JUNGLES AND DESERTS

Name______________________________ Ident. __________

School______________________________ Method __________

Grade__________ Teacher____________________ Sex __________

I will read each of the stories to you, then each of the questions and answers. Listen very carefully and read the stories, questions and answers silently to yourself while I read them to you aloud. Then choose the best answer or the best answers to each question and draw a line under them. Sometimes the questions will have only one good answer. Sometimes they will have two, three or even four good answers. You will draw a line under the one best answer or under all the good answers.

Here are some practice exercises for you to do so that you will be able to mark the answers to questions correctly.

1. I live in:

    A. Waltham

    B. Wayland

    C. Weston

    D. Newton

    E. Lexington

Draw a line under the best answer to question 1. That wasn't hard was it? Let's try another one.

B.

2. I am a:

   A. Boy

   B. Girl

3. How many of the following sentences are true?

   A. I live in Weston.

   B. I go to school in Weston.

   C I like school.

   D. I like recess.

   E. I am ten years old.

4. I am in grade:

   A. One.

   B. Two.

   C. Three.

   D. Four.

   E. Five.

Now I think you have the idea about how you will answer the questions. All of the questions will be answered by drawing a line under the best answer or the best answers. Listen carefully to each story. Read it silently to yourself as I read it to you aloud. Then listen as I read the answers. Read them to yourself silently while I read them aloud Then choose the best answer or the best answers Remember that some of the questions may have more than one good answer. Be sure to draw lines under all good answers to the questions. Are you ready?

1.

The following is a story about the desert. Read the story silently to yourself as I read it aloud. Then answer question 1.

The temperature in the desert changes from very hot days to very chilly nights. Some desert areas have reported a temperature range of as much as a hundred degrees from the hottest part of the day to the coolest time of night. The oasis of In-Salah in the Sahara Desert reported a temperature of 126 degrees at noon time and 26 degrees at night.

1. Some of the sentences below tell some of the reasons why there are such great changes in temperature in the desert. Draw a line under the best answers.
    - A. The land is not protected from the hot sun by trees.
    - B. The sand dunes, in some places, are very high.
    - C. There are not many clouds in the sky to shade the earth from the sun or keep in the heat at night.
    - D. The heat escapes from the sand and rocks very quickly at night.
    - E. There is no moisture in the air to hold in the heat of the day.

2. Most deserts have some kind of plants and animals. These plants and animals must be able to live through the hot days, the cool nights, and without much water. Some of the sentences below tell how plants and animals are able to live in the desert. Draw a line under the best answers.

   A. Some animals sleep under rocks or dig under the ground during the heat of the day.

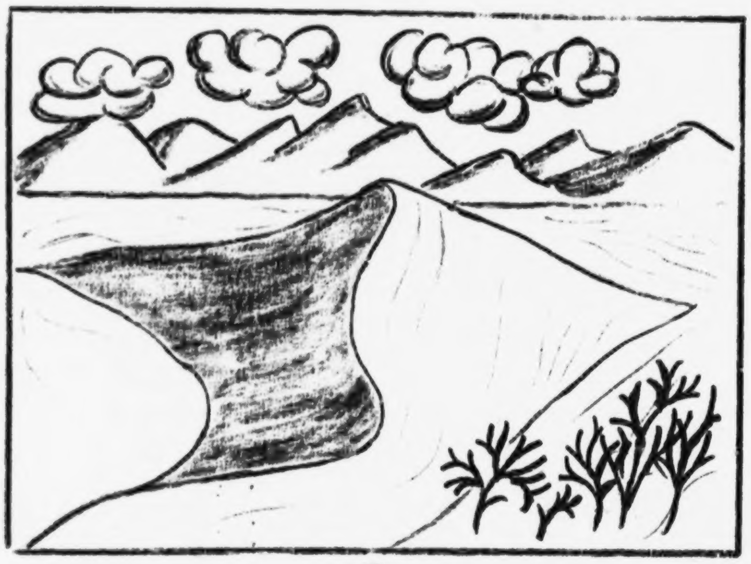
   B. Some plants store water in their stems for a long time.

   C. Some plants bloom very quickly after a rainstorm in the desert. They form seeds which will grow and bloom very quickly when it rains again.

   D. Some animals store food for the long cold winter.

   E. Some animals make their own water supply from plant stems and seeds.

Questions 3 and 4 are about the pictures of deserts shown below. Look carefully at the pictures. Read the story silently to yourself as I read it aloud. Then answer the questions.



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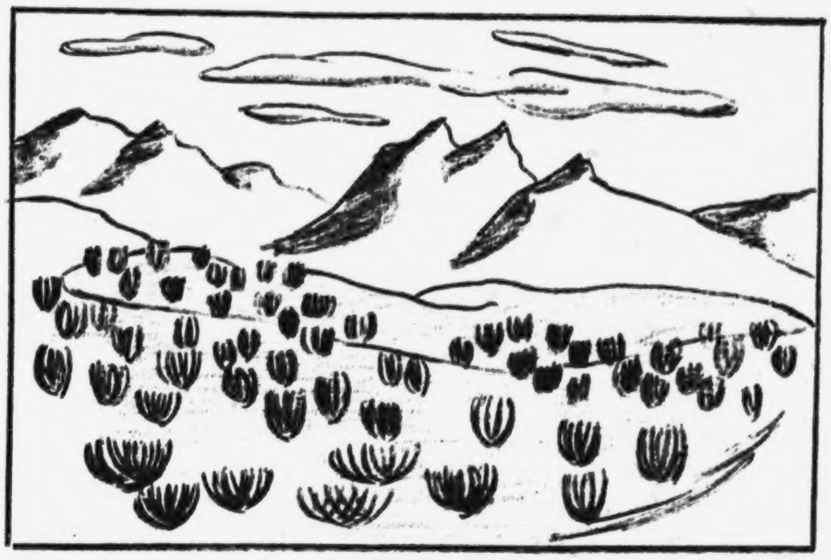


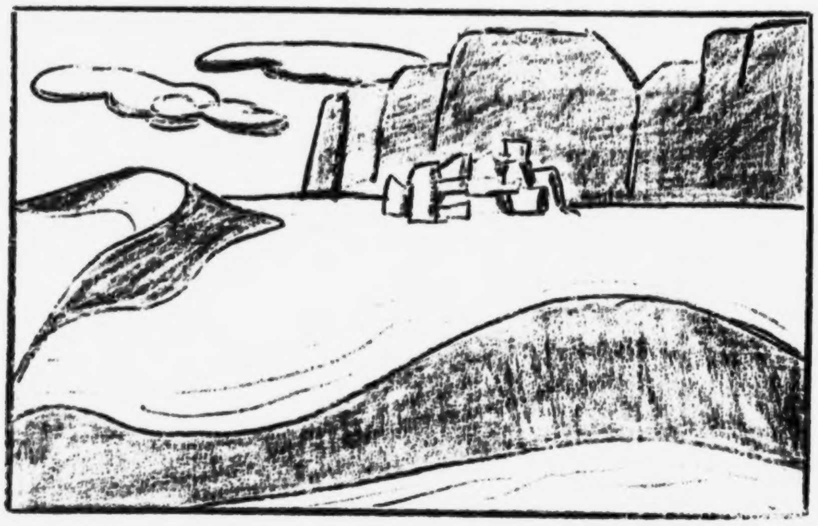
②

3. If you had to walk across both deserts on foot, which one would be easier for you to cross? Draw a line under the best answer.
   - A. The desert in picture 1.
   - B. The desert in picture 2.

4. When you answered question 3, you probably thought of some good reasons why desert picture 1 or desert picture 2 would be easier to cross. Which one of the sentences below gives the best reason for your answer? Draw a line under the best answer.
   - A. Most deserts have oases.
   - B. Camels can go for a long time without water.
   - C. Sand dunes make travel difficult.
   - D. Camels can protect their eyes from the sand blown by the wind.
   - E. It is easier to travel at night rather than during the day in a desert.

Questions 5 and 6 are about the four pictures which you see below. Look carefully at the pictures and then answer the questions.

①



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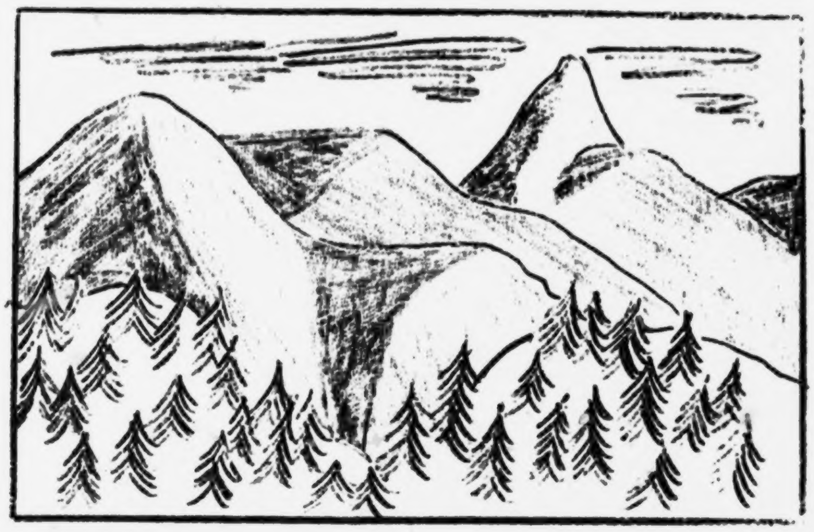

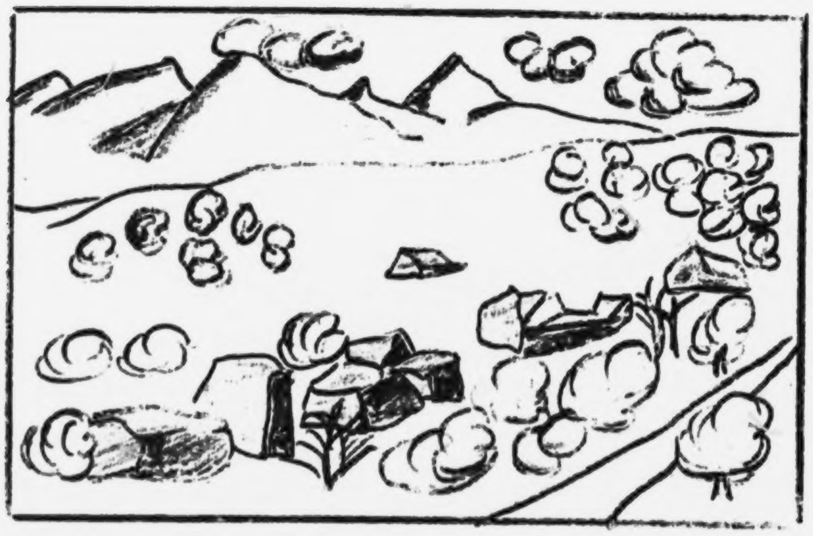

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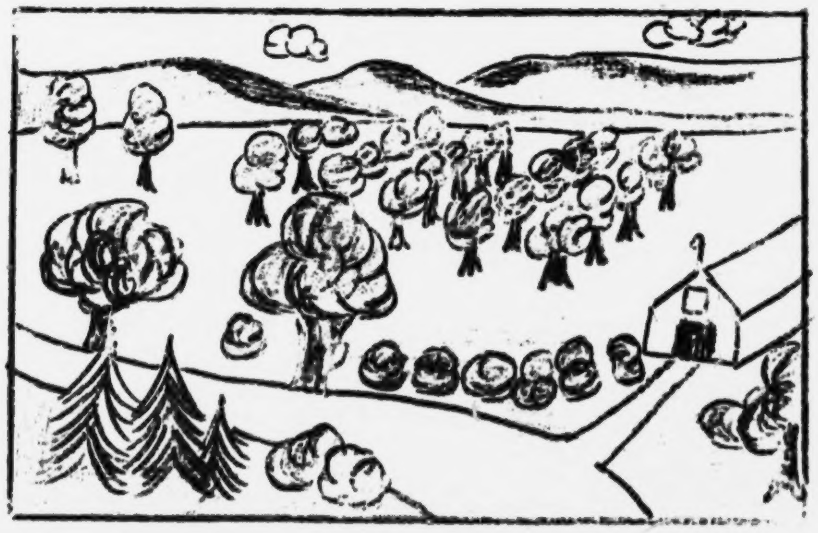


④

5. Which two pictures above do you think are pictures of deserts? Draw lines under the two best answers.

A. Picture 1.

B. Picture 2.

C. Picture 3.

D. Picture 4.

E. Pictures 1 and 4.

6. In question 5 above you were asked to choose two pictures of deserts. Some of the sentences below tell why two of the pictures are deserts. Choose the sentences which tell why the pictures you chose are deserts Draw a line under the best answers.

   A. There is very little rain in deserts (less than 10 inches per year).

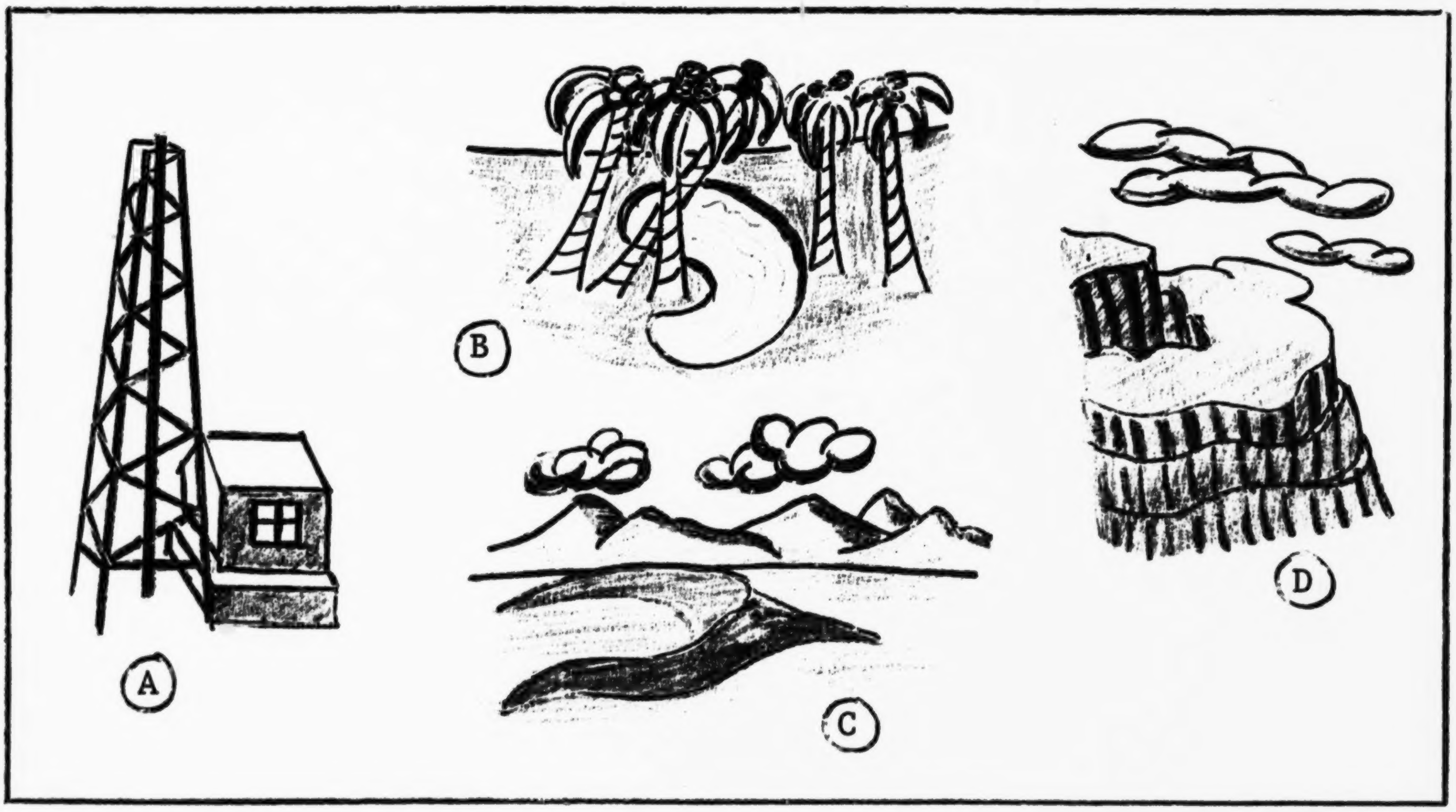
   B. Water dries up very quickly in the desert.

   C. The wind blows the sand into dunes.

   D. Most trees and plants need much water in order to grow well.

   E. When it does rain in the desert, the rain comes down too fast and too hard to do much good.

Questions 7 and 8 are based on the picture of the desert shown below. Look carefully at the picture and then answer the questions.



Look at the desert pictured above. At letter A is found an oil well. At letter B is an oasis. Letter C is a large area of sand dunes. Letter D is a rocky area.

7. At which of the places pictured above would you most likely find people living in this desert? Draw a line under the two best answers.

    A. At the oil well.

    B. At the sand dunes.

    C. At the oasis.

    D. At the rocky area.

    E. At the oasis and the rocky area.

8. Think of the answers that you underlined for question 7. Some of the sentences below give good reasons why people might live in certain places of a desert. Draw a line under the best answers.

   A. Water is needed if people are to live in a desert.

   B Irrigated desert soil can grow foods which people need.

   C. The rocky area does not have sand dunes.

   D. People may live where there are valuable natural resources.

   E. Plants and animals learn to live in desert surroundings.

9. The Namib Desert in the Union of South Africa was not fully explored until quite recently. Pretend that you were a member of the group of scientists who explored the desert.

   Some of the sentences below tell what you might have found when you explored the Namib Desert. Select the sentences which tell what you think you might have found. Draw a line under the best answers.

   A. Few people would live there except where water is available for irrigation or where valuable minerals would be found

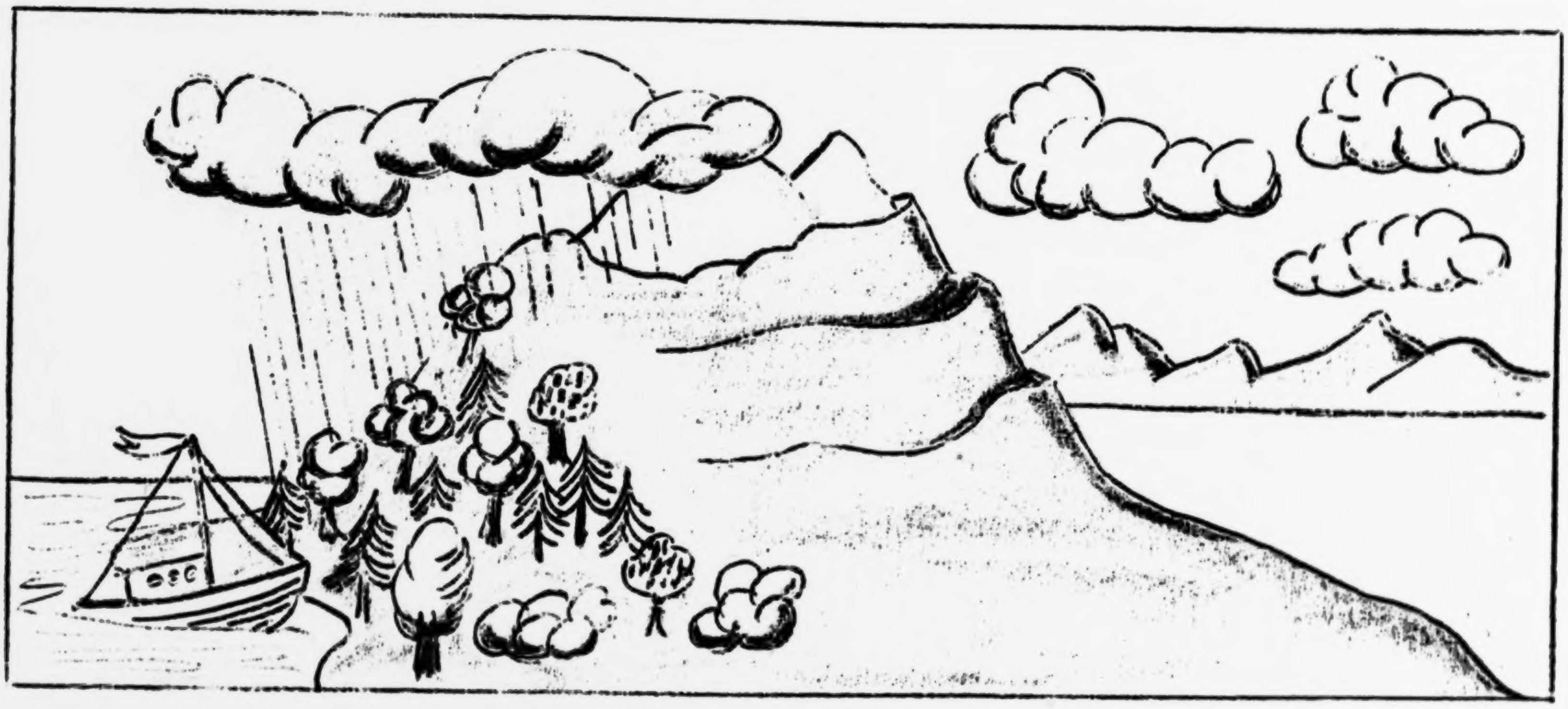
   B. No plants or animals would be found.

   C. Large areas of sand dunes would make the travel difficult in some places.

   D. The nights would be very hot

   E. Oases might be found which could provide water.

Questions 10 and 11 will be based on the picture and story which follow. Look carefully at the picture below. Read the story silently to yourself while I read it to you aloud. Then answer the questions.



Pretend that you have been on an ocean trip with some of your friends. During a big storm at sea, your ship has been washed up on the coast of a land that you have never been to. As you land on the shore, you see many trees along the beach. You can also see huge mountains near by. The mountains are very high and many miles long.

The tops of the mountains are covered with snow. Many times you cannot see the tops of the mountains because there are many clouds around them. The clouds have blown in from over the ocean. The tops of the mountains do not seem to have trees of any kind.

You and your friends decide to stay near the seashore where you landed. There is shade from the hot sun under the trees and fruits of many kinds can be found in the trees nearby. One strange thing about this land is that there are no people living there.

After a few days, you and your friends decide to climb the high mountains to see what kind of land would be on the other side.

10. Which one of the two places below do you think might be on the other side of the mountain? Draw a line under the best answer.

    A. A tropical rainforest.

    B. A desert.

11. Some of the sentences below might give you some good reasons for your choice of an answer in question 10. Draw a line under the best answers.

    A. The air would probably be hot and humid and it would rain almost every day on the other side of the mountain.

    B. It would probably be very hot during the day and very cool at night on the other side of the mountain.

    C. There would probably be little rain on the other side of the mountain.

    D. The land would probably be very dry because the hot sun would dry up water very quickly on the other side of the mountain.

    E. The clouds coming in from over the ocean would probably lose their moisture as they rose over the mountain.

Questions 12, 13, and 14 are about the following story which I will read to you. Read the story silently to yourself while I read it to you aloud.

Near the equator is found a place called the equatorial calm belt. It is always very hot there. The waters of the ocean and rivers in the equatorial calm belt are warm. There are not many breezes so the air above the land is always hot. There is always alot of moisture in the air.

Because the sun is directly overhead at noon time every day throughout the year, the moisture filled air becomes quite hot. The heated air expands and rises. It cools rather quickly as it rises. This cooling of the hot, moist air causes precipitation.

12. From the sentences below, choose the ones which tell what you would find if you were to visit an area like the one in the story I just read to you. Draw a line under the best answers.

    A. A few trees and plants.
    B. A huge area of sand dunes.
    C. An oasis with many date palm trees.
    D. Trees and plants growing closely together.
    E. Humidity and temperature which are always high.

13 Think of the place in the story I just read to you. Which of the sentences below tell what you would find? Draw a line under the best answers.

A. Cool breezes would blow in every day from over the ocean.

B. It would rain only once a week.

C Jungles would be found there.

D. Deserts would be found there.

E. It would rain almost every day.

14. Read the phrases below. Which one tells about where you would find a place like the one in the story? Draw a line under the best answer.

A. North of where we live in Massachusetts.

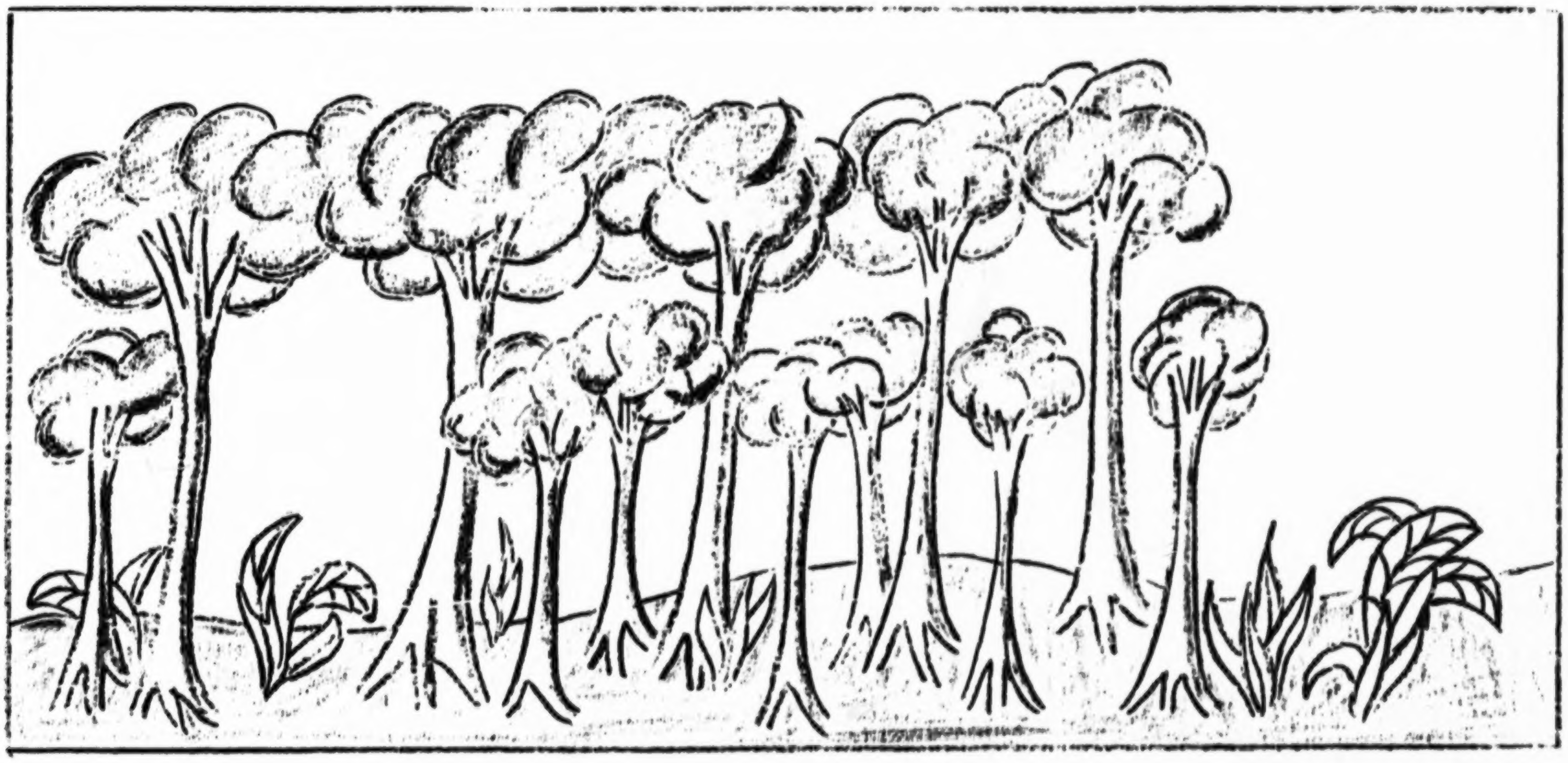
B. Near your house.

C. Near the "middle" of the earth, or the "middle" of the globe.

D. Near Boston

E. Near the South Pole.

Question 15 will be about the picture below. Look at the picture carefully and then answer the question. The picture shows part of the tropical rainforest. The tops of the trees are very close together. There are not many plants on the ground of the rainforest.



15. Which one of the sentences below gives the best reason why there are not many plants on the ground of the tropical rainforest. Draw a line under the best answer.

    A. There is too much water.

    B. There is too much sunlight.

    C. There is not enough water.

    D. There is not enough sunlight.

    E. There is not enough air.

16 There are many kinds of birds and animals in the tropical rainforest Which [redacted] of the following are found in the tropical rainforest. Draw a line under the best answers.

A. Rattlesnakes

B Camels

C. Elephants

D. Monkeys

E. Parrots

Now we are going to read a letter that a boy named Bobby Rice sent to his friend, Jimmy Wells, who lives in Weston. Bobby used to live in Weston. Read the letter silently to yourself while I read it aloud. Then answer questions 17 and 18.

April 10, 1965

Dear Jimmy,

How are you? I am fine. We arrived here in Africa a few months ago. Dad says that we live pretty close to the equator.

Boy, would you like it here! My brother and I have lots of fun playing with the other boys and girls. We go to school only in the morning. That's because we do our lessons outdoors and we sit on the ground. The ground is too wet to sit on in the afternoons so we don't go. There are lots of things to do like hunting and fishing. My new friends and I have lots of fun.

The thing I miss most is winter and playing in the snow. It doesn't snow here as it did in Weston. It's always hot and you always feel sweaty.

Maybe someday you could come and visit me. Say hello to my friends in Weston.

Your friend,
Bobby

Jimmy was happy to get a letter from Bobby He was disappointed, however, that Bobby didn't tell him more about the place where he was living.

17. Think about Bobby's letter In which place do you think Bobby lives? Draw a line under the best answer.

   A. In a desert.

   B. In a tropical rainforest.

18. Some of the sentences below may have helped you to decide where Bobby lived. Read the sentences silently while I read them aloud, then choose the ones which helped you to decide. Draw a line under the best answers.

   A. It is always hot during the day in the desert.

   B. It is always hot and humid in the tropical rainforest.

   C. Deserts are found near the equator.

   D. It rains almost every day in the tropical rainforest.

   E. Tropical rainforests are found near the equatorial calm belt.

Questions 19 through 22 will be about the adventures of Jack Sparks. Read the story silently while I read it aloud. Then answer the questions.

Jack Sparks, a famous explorer, was flying over the continent of Africa on the way to join an expedition in India. Jack's plane ran into trouble and he had to jump out somewhere over Africa. Jack jumped from his plane and pulled his ripcord. His parachute opened quickly and lowered him safely toward land.

15.

As Jack drifted toward land, he saw mostly trees. In the distance he could see what looked like a blue ribbon winding through the forest. It was a river.

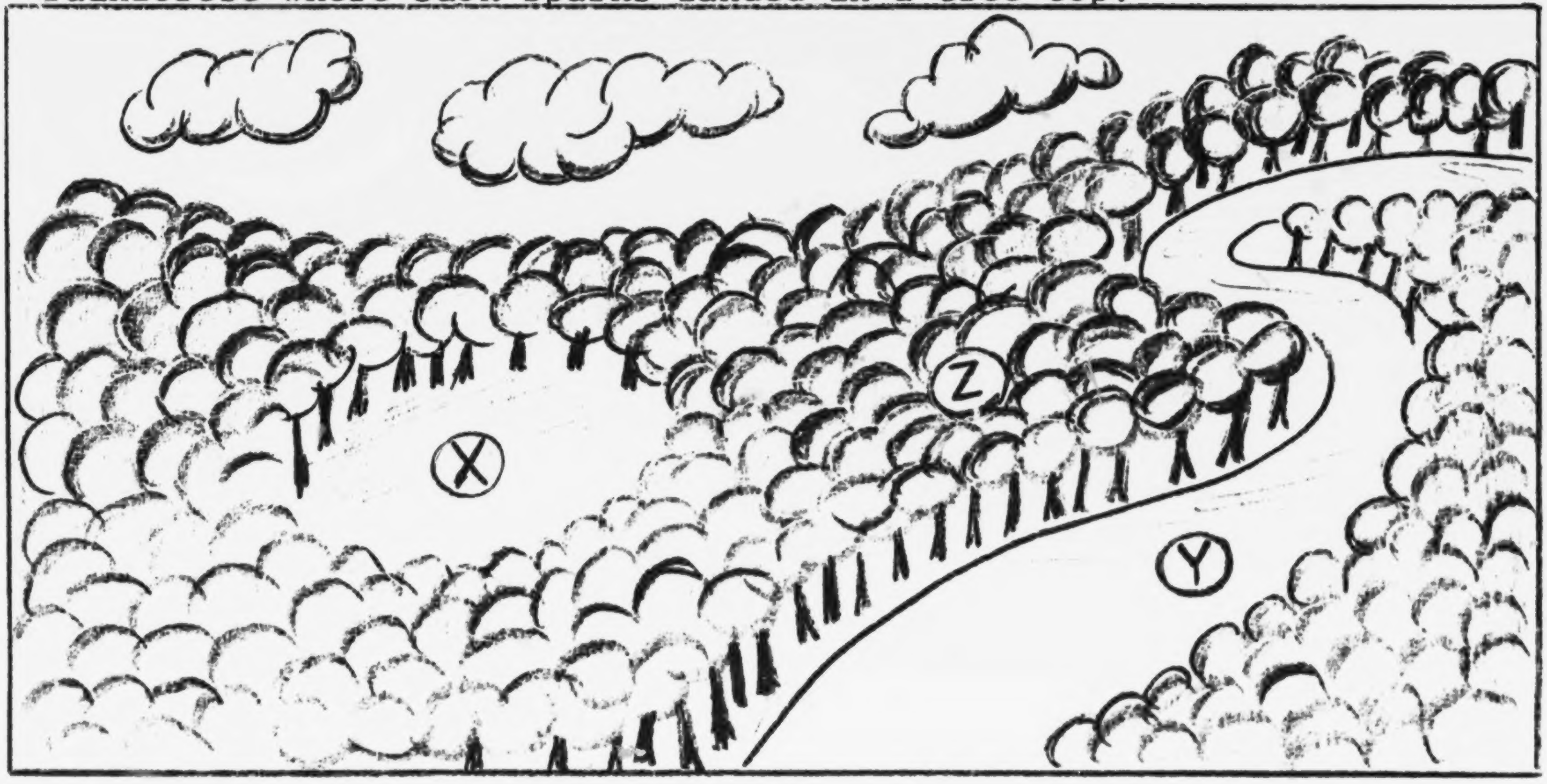
Jack landed in the top of a tree. All that he could see everywhere were tree tops. In fact, the tops of the trees were growing so close together he could not even see the ground.

It took Jack a long time to untangle his parachute. He was almost burning up from the heat of the sun. Finally, he began to climb slowly and carefully to the ground. It looked as though it would be a long way down because the trees seemed to be very tall. As he was climbing down, he felt the air becoming very heavy, hot and damp. It became so hot and stuffy, as a matter of fact, that he found it hard to breathe.

19. Below are sentences which might describe what Jack Sparks found when he reached the ground and began to look around. Choose the sentences which you think best tell the place where Jack is. Draw a line under the best answers.

    A. It would be quite dark on the ground of the forest.
    B. It would probably rain sometime during the afternoon.
    C. The air would be dry and cool on the floor of the forest.
    D. There would be an oasis nearby.
    E. There would be few plants on the ground.

Here is a picture of the Tropical Rainforest as Jack saw it from his airplane and as he parachuted to earth. Find X. X is the place in the picture of a clearing where some people used to live. Find Y. Y is the place in the picture of a river which flows through the tropical rainforest. Find Z. Z is the place in the picture in the middle of the rainforest where Jack Sparks landed in a tree top.



Look at the picture carefully.

20. Jungles are places in the tropical rainforest where thick vines and many plants and bushes grow. Jungles are found in a tropical rainforest wherever the sun reaches the ground. Where do you think Jack would find jungle growth? Choose from the sentences below the ones which give the best answers. Draw a line under the best answers.

    A. On the banks of the river at place Y in the picture.
    B. Where Jack landed at place Z in the picture.
    C. Around the edge of the clearing at place X in the picture.
    D. The ground under the tree where Jack landed at place Z in the picture.
    E. Nowhere in the picture.

Jack Sparks made his way through the forest along a path which animals had made. As he moved along the path, he could hear all kinds of noises made by different animals. He stopped and looked around very carefully.

21. Which of the following do you think Jack would have seen as he looked around? Draw a line under the best answers.
    - A. Birds.
    - B. Horses.
    - C. Monkeys.
    - D. Snakes.
    - E. Camels.

Jack then started walking again. All of a sudden he stopped Up ahead he could hear the sound of running water. Sunlight was beginning to make its way through the tree tops. The plants under his feet became thicker as he moved toward the sunlight and the sound of water.

22. Read the sentences below. Which ones tell what Jack would find as he moved toward the sound of water? Draw a line under the best answers.
    - A. The air would become cool and dry
    - B. The plants and bushes would become thick and tangled
    - C Sand dunes would make it hard to travel
    - D. Jungle growth would be found near the banks of the river.
    - E. An oasis would be found nearby.

QUESTIONNAIRE FOR TEACHERS OF EXPERIMENTAL GROUPS

Name____________________________Instructional Method_________

1. Do you feel that your pupils were able to understand the concepts and generalizations included in the study?

   a. Yes No

   b. All of them Some of them None of them

2. Do you feel that the posttest will adequately represent the degree of understanding which pupils have of the concepts and generalizations included in the study?

   a. Yes No Not sure

3. Do you feel that the films used for the study were successful in bringing about an understanding of the concepts and generalizations included in the study?

   a. Yes No

   b. Highly successful Generally successful Unsuccessful

4. Do you feel that the filmstrips used for the study were successful in bringing about an understanding of the concepts and generalizations included in the study?

   a. Yes No

   b. Highly successful Generally successful Unsuccessful

5. Would you say that the films or the filmstrips were generally more successful in bringing about an understanding of the concepts and generalizations included in the study?

   a. Films Filmstrips Both films and filmstrips Not sure

6. Do you feel that the instructional approach you used was successful in bringing about an understanding of the concepts and generalizations included in the study?

   a. Yes No

   b. Highly successful Generally successful Unsuccessful

7. Do you feel that another instructional approach would have been successful with your pupils?

   a. Yes No Maybe I don't know

8. Do you feel generally that the filmstrips and films were appropriate for viewing by the primary grade children?

   a. Yes No

   b. Highly appropriate Generally appropriate Inappropriate

9. Do you feel that this type of approach to social studies would be generally valuable for primary grade pupils?

   a. Yes No Possibly

   b. Highly valuable Generally valuable Not valuable

10. Please make additional comments about the lessons, organization, time schedule, appropriateness of materials, redundancy, etc., that you feel would be of value in evaluating the outcomes of the study.

QUESTIONNAIRE FOR PARENTS

1. Has your family and your child ever lived in a region classified as a desert or tropical rainforest?

   Yes No If yes, please explain.

2. Has your family and your child ever visited regions classified as desert or tropical rainforest?

   Yes No If yes, please explain.

3. Has your child talked about either or both of these regions with friends or relatives who may have lived in or visited these regions?

   Yes No If yes, please explain.

4. Are there books or magazines to which your child has been exposed that may have contained pictures or articles on the two regions?

   Yes No If yes, please list.

5. Has your child viewed slides or movies, outside of school, which may have dealt with either of these two regions?

   Yes No If yes, please explain briefly.

6. Has your child talked to you about the lessons which he has experienced in recent weeks on the desert and the tropical rainforest?

   Yes No

7. Please feel free to make any additional comments.

APPENDIX D

Lesson 1, Inductive

OBJECTIVES

The child will perceive a causal relationship between the lack of vegetation, cloud cover, water vapor and the great change in temperature from day to night in the desert.

CONCEPTS AND GENERALIZATIONS: D_1*

MATERIALS

1. Group A filmstrips: Desert filmstrip 187-A-1.
2. Diagram of heat absorption and loss.
3. Duplicated sheet of above for each pupil.
4. Sheet of paper for each pupil.

PROCEDURE

1. View filmstrip No. 1, "Desert," from Group A. Have pupils fill in missing words or letters in the programmed frames.

2. Show the filmstrip again rather quickly to reinforce the material presented.

3. Ask pupils questions such as the following:

    a. Why do you suppose that there is such a great change in temperature from day to night in the desert?

    b. Have you ever walked barefooted on a sandy beach on a hot summer afternoon when the sun was shining brightly? How did it feel? Have you walked barefooted on a sandy beach on a summer evening or summer night after the sun has gone down? How did it feel? Why do you think the sand is so hot during the day and yet so cool at night?

    c. Show pupils the diagram from The Desert, Life Nature Library without titles or subtitles. Give each pupil a copy of the diagram. Ask pupils to hypothesize what they think it means. Point out to them

*D_1 refers to concept or generalization #1 for the desert. The list of concepts and generalizations is found in the handbook. A card for ready reference while teaching will be found in the inside pocket of the folder.

the clouds, the trees, the water and the humid land and the lack of these in the desert. Elicit ideas from them to see if they can come to an understanding of the causal relationships between vegetation, cloud cover, etc., and the lack of them as they relate to changes of temperature in the desert.

d. Ask pupils about their experiences in trying to sleep on a hot, humid summer night. What makes it so hot and so uncomfortable? The deserts are never this way. Why?

e. Ask pupils why they cover themselves with blankets to sleep in the winter. What would it be like if they had no blanket? Try to relate this to heat loss in a desert since there are no clouds or water vapor to "hold in" the heat of day.

4. Use the answers which children give and, by use of questioning, try to get them to state the causal relationships that are necessary to the understanding of the generalization. Write the generalization in their words on the board. Do not impose adult vocabulary on the pupils. If they seem to be unable to grasp the generalization, drop the discussion and return to it at a later time.

5. In subsequent lessons, ask the lead questions previously used to reinforce the understanding which pupils have gained.

Lesson 2, Inductive

OBJECTIVES

The child will gain the understanding that a desert is a dry place with little rain; he will come to understand that the rain which does fall in the desert evaporates very quickly.

CONCEPTS AND GENERALIZATIONS: D_1, D_2

MATERIALS

1. Filmstrip Group A, filmstrips 187-A-2 to 187-A-5.
2. Map: "Desert Lands of the World."
3. Map: "Rainfall Map--Selected Regions of the World."

PROCEDURE

1. Give pupils their individual maps of rainfall and the deserts. Ask them to compare and contrast the two maps. Ask pupils what they think they are going to do with them. Have pupils do some of the following:

    a. Compare the amount of moisture which falls in the northeast United States where they live with that which falls in desert areas.

    b. Compare location of desert lands with rainfall map.

    c. From these data, try to get pupils to discover that the desert is a dry place with little rain.

2. Show each of the filmstrips in Group A, beginning with #2, in sequence. If you feel it desirable, you may review briefly filmstrip 1 which was shown in Lesson 1. Spend little time on filmstrip #4 as the topic will be dealt with in more detail in other lessons.

3. Ask pupils to try to construct a definition of a desert which would be applicable to all desert areas. It should be defined in terms of the small amount of rainfall. The notion that rapid evaporation occurs also should be brought out through skillful questioning.

4. Remember that it is not necessary to have the pupils express the concept or generalization as it is presented in D_2. The goal is, that through guided discovery learning, pupils will come to an understanding of the essential elements which constitute the concept or generalization and understand the relationships which exist among the various elements in the concept or generalization.

Lesson 3, Inductive

OBJECTIVES

The child will reinforce his understanding of what constitutes a desert, will reinforce his understanding of the common characteristics of deserts, and will attain the understanding that sand dunes hinder transportation in a desert.

CONCEPTS AND GENERALIZATIONS: D_2, D_3, D_4

MATERIALS

1. Group B filmstrips.
2. Set of 5 "Curriculum Color Prints."
3. A globe.
4. Map: "Desert Lands of the World."

PROCEDURE

1. Ask pupils why they think the desert is a dry place. Why doesn't it rain much? List some of the answers to refer to later.

2. Show the filmstrip, "The Great American Desert." In the first few frames of the filmstrip, reinforce the concepts which, hopefully, the pupils have previously established--that the desert is a dry place. Spend some time on frames which indicate why the desert is dry. In particular, ask the youngsters to try to explain the diagram in frame 12 in terms of why the desert is a dry place.

3. After viewing the filmstrip, ask the pupils how they think plants and animals can survive in a place that is so dry. Allow them to discuss this.

4. Show the filmstrip, "Climate and Man," as follows:

    a. Show frames 1-6 briefly, establishing the terms weather and climate, etc. Define these terms for them if they are beyond the experience range of the children.

    b. Skip to frame 11; ask the pupils to try to interpret the diagram in reference to why deserts are dry.

    c. Ask pupils to locate the major desert regions of the world on frame 13. Have them locate the major desert areas of the world on their own individual map.

    d. Skip to frame 17. Spend some time on frames 17, 18 giving pupils the concept of irrigation. They will most likely be able to grasp the essence of irrigation but the term itself may have to be given to them.

    e. Stop viewing the filmstrip after frame 17. Shut off the projection lamp and remove the filmstrip.

5. Show the filmstrip, "Vegetation and Man," as follows:

    a. Go directly to frames 20-23.

    b. Briefly discuss these frames in reference to adjustment of plant life.

6. Display the set of 5 "Curriculum Color Prints" for the pupils. Then ask the following questions"

    a. What characteristics do these 5 color prints have in common? Why do some differ from others? Take a closer look. What are the common characteristics of deserts?

   b. As a side issue, ask pupils to observe print no. 2 and ask them how they think it would be to travel in an area represented by the sand dunes as compared with some of the other areas. Guide them to discover the fact that sand dunes in a desert area make travel difficult.

7. Refer to statements made at the beginning of the lesson as to why deserts are dry places. Check hypotheses against the learning experiences which they have just completed.

Lesson 4, Inductive

OBJECTIVES

The child will perceive that plants and animals of the desert have adjusted to the high heat and the low amount of moisture.

CONCEPTS AND GENERALIZATIONS: D_2, D_3, D_4, D_5

MATERIALS

1. Group C filmstrips

PROCEDURE

1. Ask pupils what kinds of plants and animals they might expect to find in a desert. Ask them to give reasons for their answers and list them.
2. Show the filmstrip, "Deserts," T435-8 as follows:
   a. Ask pupils how it would be to travel in the desert pictured in the frames. Ask pupils to give the meaning of the diagram in frame 4 and relate it to why desert areas are dry. In frame 6, bring out the idea of sand dunes making travel difficult. As the children view the rest of the filmstrip, ask them to generalize about animals and plants in the desert and what they must do in order to survive.
3. View the filmstrip, "Plants and Animals of the Desert," A-462-2.
   a. Throughout the presentation of this filmstrip, have students point out how the plants and animals have made adjustments to the desert environment. In a summation of that which they have seen, try through questioning to get the pupils to state the concept of adjustment or its equivalent in terms of how plants and animals can survive in a desert.

4. Show the filmstrip, "How Animals Live in the Desert," 446.

    a. After viewing the filmstrip, ask pupils to generalize as to how plants and animals survive in a desert environment and how they adjust to the heat and the small amount of moisture. Discuss the kangeroo rat, specifically, in connection with adjustment to small amount of moisture.

    b. Relate findings of the lesson to procedure #2.

Lesson 5, Inductive

OBJECTIVES

The child will broaden his understanding of how plants and animals adjust to the desert environment.

CONCEPTS AND GENERALIZATIONS: D_4

MATERIALS

1. Group D filmstrips

PROCEDURE

1. Ask children why only certain plants and animals live in the desert. Why is it that not all kinds of plants live in the desert? List answers.

2. Show filmstrip, "Plant Life in the Desert," 8286.

    a. Again have children "discover" and generalize how plants and animals adjust to the extreme heat and low amount of moisture in the desert.

3. Show the filmstrips, "Desert Life Community," 243, and "Reptiles of the Desert," 8284.

    a. These filmstrips will tend to give further background information to the child so that he will be better able to come to an understanding of the concepts or generalizations which are being presented relative to adjustment of plants and animals to the desert environment. Every opportunity should be taken to allow pupils to restate the concept or generalization in their own terms.

    b. Refer findings of the lesson to answers given at the beginning of the lesson.

Lesson 6, Inductive

OBJECTIVES

The child will perceive the relationship between sources of water in the desert and the number of people who live there. He will gain an understanding of the methods of irrigation and its necessity if life is to be sustained in desert regions.

CONCEPTS AND GENERALIZATIONS: D_4, D_5, D_6

MATERIALS

1. Group E filmstrips.

PROCEDURE

1. Ask pupils if people live in a desert. If not, why not? If so, why? List some of the answers to refer to at the end of the lesson.

2. Show the following filmstrips in the order indicated:

    a. "Life in Desert Lands," 349086
    b. "Oases in Libya," 9222
    c. "Life Along the Nile," 9221
    d. "Life in Egypt," 183

    The purpose of showing these filmstrips is to allow children to come to an understanding that deserts, generally speaking, are sparsely inhabited except where there is sufficient amount of water for irrigation, as along the Nile River in Egypt.

3. Another purpose of the showing is to allow children to come to an understanding of what an oasis is.

4. These filmstrips should be shown fairly quickly. Much of the information presented in the filmstrips is not applicable to the matter at hand. Wherever the opportunity presents itself, lead children to discuss the meaning of the term oasis, which will have to be presented to them, and the meaning and import of the term irrigation and what it means to people living in these areas.

5. Through skillful questioning, lead the children to an understanding of the importance of irrigation to human life in the desert areas.

6. Refer back to statements made in procedure #1.

Lesson 8, Inductive

OBJECTIVES

The child will come to an understanding that it is hot and wet in the tropical rainforest; that it rains daily with heavy storms coming in mid-afternoon; that ground vegetation is sparse due to absence of sunlight on the ground.

CONCEPTS AND GENERALIZATIONS: J_1, J_2, J_4

MATERIALS

1. Group F filmstrips, "Tropical Rainforest," 187-G-4,5,6.

2. Diagram of parts of a tree. (Chart as in lesson 7).

PROCEDURE

1. Ask pupils to tell what they think it would be like on the ground of the tropical rainforest. List some of the answers.

2. Show filmstrips 4 and 5 of Group F. Guide the students to "discover" that the closeness of the tree crowns would make the floor or the ground of the rainforest quite dark. Use the chart on the parts of a tree to present the meaning of crown.

3. Guide the pupils to discuss and "discover" the conditions necessary for plant growth (i.e., heat, light, water, air). Relate this to the conditions existing in the tropical rainforest, particularly in reference to the crowns of the trees.

4. Show filmstrip No. 6 which is a test. If the class indicates the need to review filmstrips 1, 2, 3, do so at this time. Insofar as it is possible, guide pupils to state in their own words some of the basic concepts and generalizations relating to the temperature, humidity, precipitation and sparseness of ground vegetation as they occur in the tropical rainforest.

5. Review the lesson by making reference to the answers listed in procedure #1.

Lesson 10, Inductive

OBJECTIVES

The child will come to an understanding that birds, snakes, and monkeys are found in the tropical rainforest.

CONCEPTS AND GENERALIZATIONS: J_5

MATERIALS

1. Group H filmstrips.

PROCEDURE

1. Ask pupils to list the kinds of animals that may be found in the tropical rainforest.
2. Briefly and without much discussion show the filmstrips, "Birds of the Tropical Forests," 8975, "Reptiles and Amphibians of the Tropical Forest," 8976, and "Monkeys of the Tropical Forests," 8973.
3. Upon completion of the filmstrips, guide the pupils to state generally the kind of animal life that they would find in the tropical rainforest.
4. Check list against viewing of filmstrips. Tell pupils that if they had listed some which did not appear, that a film ("Animals of the Indian Jungle") to be shown may prove them to be right.

Lesson 12, Inductive

OBJECTIVES

The child will grow in his ability to comprehend the elements of the desert and life in the desert as expressed in the concepts and generalizations which are central to the unit of study.

CONCEPTS AND GENERALIZATIONS: D_2, D_3, D_4, D_5, D_6

MATERIALS

1. Group J film.

PROCEDURE

1. Tell pupils that they are going to see a movie about a desert in California. Ask them to discuss briefly what they might see in the film. List or make note of some of the ideas and refer back to them at the end of the lesson.

2. Show the film, "Life in the Hot, Dry Lands," (California).

3. Rewind the film and show it again with the sound off. Ask the following questions at appropriate places in the film during the second showing:

   a. Why is the desert such a dry place?

   b. How do plants and animals live in a place that is so hot and has so little water?

   c. Would sand dunes make travel difficult? Why?

   d. What is an oasis?

   e. If people live in a desert, where would you most likely find them?

4. Upon completion of the second showing of the film, discuss with pupils in greater detail, the questions asked during the second showing. Guide them in their discussion, through skillful questioning, to phrase in their own words, the concepts D_2 to D_6.

5. Bring the lesson to an appropriate close.

lesson 14, Inductive

OBJECTIVES

The child will grow in his ability to comprehend the elements of the desert and life in the desert as expressed in the concepts and generalizations which are central to the unit of study.

CONCEPTS AND GENERALIZATIONS: D_1, D_2, D_3, D_4, D_5, D_6

MATERIALS

1. Group L films.

PROCEDURE

1. Tell pupils that they are going to see two films. One film will show how and where people live in desert areas and the other will show how plants and animals live in the desert.

2. Show the films, "Life in an Oasis" and "The Desert."

3. If time permits, have pupils discuss the following questions:

   a. What is a desert?

   b. How do plants and animals survive the high heat and the low amount of moisture?

   c. Where do you find people living in a desert?

   d. How would sand dunes affect travel in the desert?

4. Guide pupils, time permitting, to state the main ideas which they have seen in the films by applying the questions in procedure #3. Guide them to include the basic information included in the concepts and generalizations, stated in their own words.

Lesson 16, Inductive

OBJECTIVES

The child will develop an understanding that desert lands can become productive when irrigated.

CONCEPTS AND GENERALIZATIONS: D_6

MATERIALS

1. Group N film.

PROCEDURE

1. Tell pupils that they are going to see a film which will show them how important water is to life. Tell them that they will learn many things about water, dams and electricity.

2. Show the film, "Water in the West."

3. Discuss the film with pupils and ask the following questions:

   a. Why has our government gone to so much trouble to build dams in the western part of our country?

   b. Why is water so important?

   c. What is irrigation? Why is it so important to people who live in dry lands?

4. By means of questioning, guide pupils to an understanding of the importance of water to people in dry lands. Relate this learning experience to previous lessons where oases have been discussed.

Lesson 18, Inductive

OBJECTIVES

The child will grow in his understanding of the tropical rainforest in terms of amount of rain and rapid growth of vegetation.

CONCEPTS AND GENERALIZATIONS: J_1, J_2, J_3, J_4, J_5, J_6

MATERIALS

L. Group P films.

PROCEDURE

1. Tell pupils that they will see films about the tropical rainforest, some people who live there and animals which are found there. Ask them to predict what they will see. Refer back to these predictions at the end of the lesson.

2. Show the films in this order: "Life in Hot, Wet Lands"
   "The Tropical Rainforest"

3. Upon completion of the showing, ask pupils the following questions:

   a. Where are tropical rainforests located?

   b. What is the temperature in the tropical rainforest throughout the year?

   c. How much more frequently does it rain in the tropical rainforest than it rains where we live?

   d. What types of animals live in the tropical rainforest?

   e. Where do you find plants, grasses and bushes growing thickly in the tropical rainforest?

4. In the questioning, guide pupils to consider all the elements necessary for the understanding of J_1 to J_6 as you have them. However, do not force adult words in place of their understandings. Try to get them to approximate the concepts and generalizations.

5. Bring the lesson to an appropriate close.

Lesson 20, Inductive

OBJECTIVES

The child will gain in understanding of the water cycle and how it relates to the climate of the tropical rainforest.

CONCEPTS AND GENERALIZATIONS: J_1, J_2

MATERIALS

1. Group R film.

PROCEDURE

1. Tell pupils that they are going to see a film about the water cycle. Ask them to guess what they think the "water cycle" might be.
2. Show the film, "The Water Cycle."
3. Ask them what the water cycle is and compare responses to their previous guesses.
4. Ask pupils what this film might tell them about the tropical rainforest.
    a. Guide them to remember the equatorial calm belt and the high temperature and humidity in that region.
    b. Guide them to recall that the ocean water in the equatorial calm belt is always warm. Ask them why this is so.
    c. Ask the following question: Does the warm water in the equatorial calm belt have anything to do with the frequent rains in the tropical rainforest?
5. Replay the film again with the sound off and ask pupils to think why it rains so often in the tropical rainforest.
6. Bring the lesson to an appropriate close.

Lesson 1, Deductive

OBJECTIVES

The child will perceive a causal relationship between the lack of vegetation, cloud cover, water vapor and the great change in temperature from day to night in the desert.

CONCEPTS AND GENERALIZATIONS: D_1

MATERIALS

1. Group A filmstrips: Desert filmstrip 187-A-1.
2. Diagram of heat absorption and loss.
3. Duplicated sheet of above for each pupil.
4. Sheet of paper for each pupil.

PROCEDURE

1. Write D_1 on the board and discuss it with pupils.

2. Substitute words in D_1 (e.g., empty for barren, trees for vegetation, etc.) so that it is more meaningful to pupils.

3. Show filmstrip 1 from Group A, "Desert." Have pupils fill in missing words and/or letters in programmed frames.

4. Show filmstrip again rather quickly.

5. Show diagram of heat absorption and loss and give each pupil a duplicated copy of the diagram.

6. Discuss the meaning of the diagram and relate it to D_1.

7. Show pertinent frames of filmstrip again and apply generalization to the specific desert scenes shown in the filmstrip.

8. Repeat any or all of the previous steps until you get some evidence that pupils have gained an understanding of the concept.

Lesson 2, Deductive

OBJECTIVES

The child will gain the understanding that a desert is a dry place with little rain; he will come to understand that the rain which does fall in the desert evaporates very quickly.

CONCEPTS AND GENERALIZATIONS: D_1, D_2

MATERIALS

1. Group A filmstrips: filmstrips 187-A-2 to 187-A-5.
2. Map: "Desert Lands of the World."
3. Map: "Rainfall Map--Selected Regions of the World."

PROCEDURE

1. Write generalization D_2 on the board and then substitute words where necessary to make it meaningful to the child.

2. Give pupils their rainfall map so they can contrast amount of rainfall in desert areas with amount of rainfall in the northeast United States where they live.*

3. Show all of the filmstrips in the series (Group A). Briefly review the filmstrip shown in lesson 1. Spend little time on filmstrip #4 as this topic will be dealt with more thoroughly in other lessons.

4. Have pupils fill in frames to all items including the test filmstrip #5.

5. Review D_2 in conjunction with filmstrips viewed. Show selected frames again to apply the generalization to the specific situation pictured.

6. Reinforce D_1 where applicable in the lesson.

*If the concept of inches of rainfall is difficult for pupils to grasp, ask them to watch and listen to a weather program on TV after a rain storm and note how the term is used. You may also bring in a weather chart from a daily paper which would give the amount of rainfall which has occurred during a given period. The important idea to get across is the small amount of rainfall in a desert area. You might ask pupils about their personal experiences (e.g., finding water in a tin can, a puddle, etc., after a rainfall) which may help them acquire the concept of inches of rainfall.

Lesson 3, Deductive

OBJECTIVES

The child will reinforce his understanding of what constitutes a desert, will reinforce his understanding of the common characteristics of deserts, and will attain the understanding that sand dunes hinder transportation in a desert.

CONCEPTS AND GENERALIZATIONS: D_2, D_3, D_4

MATERIALS

1. Group B filmstrips.
2. Set of 5 "Curriculum Color Prints."
3. A globe.
4. Map: "Desert Lands of the World."

PROCEDURE

1. Write D_2, D_3 and D_4 on board. Rephrase in language of pupils (See lessons 1 and 2).

2. Show the filmstrip, "The Great American Desert."

    a. Apply D_2 as it is presented in frame 2.

    b. Spend time discussing the frame which includes diagram showing how clouds lose their moisture as they travel over the mountain.

    c. Apply D_3 where applicable to the frames in the second half of the filmstrip.

3. Review D_2 and D_3 and ask pupils to give specific instances as to how they were applied in the filmstrip.

4. Show the filmstrip, "Climate and Man," as follows:

    a. Show frames 1-6 briefly. Spend a minimum amount of time clarifying terms presented.

    b. Skip to frame 11. Discuss this diagram as a reason why deserts are dry.

    c. Locate major desert regions in frame 13. Have pupils locate them on their maps.

    d. Skip to frame 17.

    e. Spend some time on frame 18 and introduce the concept of irrigation. End viewing of this filmstrip here.

5. Show the filmstrip, "Vegetation and Man," as follows:
    a. Show only frames 20-23.
    b. Apply D_3 to these particular frames. Do not spend much time on these frames.
6. Display set of 5 "Curriculum Color Prints" on the desert.
    a. Read portions of information marked in red on the back of the cards.
    b. Apply D_2, D_3, D_4 to the pictures. Ask pupils to apply concepts and generalizations to appropriate pictures.
    c. Stress the application of D_4 to curriculum print #2. Show by contrast to pictures 1, 3, 4, 5 why this is so.

Lesson 4, Deductive

OBJECTIVES

The child will perceive that plants and animals of the desert have adjusted to the high heat and the low amount of moisture.

CONCEPTS AND GENERALIZATIONS: D_2, D_3, D_4, D_5

MATERIALS

1. Group C filmstrips

PROCEDURE

1. Write D_2, D_3, D_4, D_5 on board.
2. Rephrase D_3 and D_4 so that they are meaningful to pupils.
3. Show the filmstrip, "Deserts," T435-8, as follows:
    a. Apply D_2 and D_4 where applicable.
    b. Note adjustments which plants and animals have made to excessive heat and low moisture.
4. Show the filmstrip, "Plants and Animals of the Desert," A462-2.
    a. Apply the generalization to the specific cases presented to illustrate its meaning.

5. Show the filmstrip, "How Animals Live in the Desert," 446.
    a. Apply concepts and generalizations indicated above to specific frames shown here.
    b. Note particularly the adjustments which the camel, gila monster, and kangeroo rats make to desert environments.

Lesson 5, Deductive

OBJECTIVES

The child will broaden his understanding of how plants and animals adjust to the desert environment.

CONCEPTS AND GENERALIZATIONS: D_4

MATERIALS

1. Group D filmstrips

PROCEDURE

1. Write D_4 on the board and discuss with pupils.
2. Show the filmstrip, "Plant Life of the Desert," 8286.
    a. Apply generalization to specific plants presented in the filmstrip.
    b. Ask pupils to explain how plants adjust to extreme heat and low moisture.
3. Show the filmstrips, "Desert Life Community," and "Reptiles of the Desert."
    a. These two filmstrips give only minimal opportunity to apply D_4. However, they will extend the background information of the child.
    b. Use any opportunity to apply previous concepts or generalizations.

Lesson 7, Deductive

OBJECTIVES

The child will come to an understanding that it is hot and wet in the tropical rainforest; that it rains daily with heavy storms coming in mid-afternoon; that ground vegetation is sparse due to absence of sunlight on the ground.

CONCEPTS AND GENERALIZATIONS: J_1, J_2, J_4

MATERIALS

1. Group F filmstrips, Tropical Rainforest, 187-G-1, 2, 3.
2. Diagram of parts of a tree (chart).

PROCEDURE

1. Write J_1, J_2, J_4 on the board and discuss them with pupils.
2. Substitute words in concepts and generalizations to make them more meaningful to pupils.
3. Show filmstrips 1, 2, 3 and have pupils fill in blanks in programmed instruction.
4. Review filmstrips again quickly and demonstrate specific application of concepts and generalizations J_1, J_2, J_4.
5. Continue discussion and/or specific application of concepts and generalizations until pupils show evidence that they have gained an understanding of them.

Lesson 9, Deductive

OBJECTIVES

The child will begin to understand the relationship between the presence of high temperature, humidity, and precipitation and the equatorial calm belt. He will understand that tropical rainforests are found near the equator.

CONCEPTS AND GENERALIZATIONS: J_1, J_3, J_4, J_5

MATERIALS

1. Globe
2. Group G filmstrips
3. Map: "The Tropical Rainforest"
4. Map: "World Air Movements"
5. Map: "The Equatorial Calm Belt"

PROCEDURE

1. Write J_1, J_3, J_4, J_5 on board and clarify their meaning for pupils.

2. Show filmstrip, "Land of the Tropical Forests," 8791.

    a. Dwell on the first six frames to apply J_4.

    b. Apply J_5 where applicable.

3. Show filmstrip, "Climate and Man," 405216, as follows:

    a. Discuss frames 1-6 briefly.

    b. Skip to frame 13. Locate Humid Tropical Lands.

    c. Skip to frame 23. Locate Humid Tropical Lands.

    d. Study frame 24. Discuss meaning of frame 24 in terms which pupils may be able to understand.

    e. Turn off light and remove filmstrip.

4. Have pupils locate tropical rainforests on the map provided to them.

5. Show the filmstrip, "Vegetation and Man," 405212.

    a. Discuss frames 1-6 thoroughly.

    b. Skip to frame 25. Discuss frames 25, 26, 27 with pupils.

    c. Turn off light and remove filmstrip.

6. Have pupils study the maps, "World Air Movements" and "The Equatorial Calm Belt," and locate the equatorial calm belt.

    a. Point out to them that lack of winds and strong ocean currents in the equatorial calm (doldrums) causes water to be warm and thus air above water to be warm and moisture-laden. When the moist air is heated by the sun, it rises and cools. As it cools it causes precipitation.

    b. Apply J_2 to above information and visual experiences which pupils have had.

7. Demonstrate the application of J_1, J_2, J_3, J_4, J_5 to the experiences which pupils have had.

Lesson 11, Deductive

OBJECTIVES

The child will begin to come to an understanding that jungle growth is found on the banks of rivers in the tropical rainforest.

CONCEPTS AND GENERALIZATIONS: J_6

MATERIALS

1. Group I filmstrips

PROCEDURE

1. Write J_6 on the board. Discuss it with pupils and substitute words which would be more meaningful for pupils (e.g., is able to reach for penetrate, area for tract).

2. Dwell on the first few frames of each of the two following filmstrips which show jungle growth along the banks of the Amazon River:

   a. "Amazon Village," 191
   b. "The Story of Rubber," 192

3. The remainder of the filmstrips should be viewed very quickly as the general content is irrelevant to the purposes of this unit.

Lesson 13, Deductive

OBJECTIVES

The child will come to understand that few people live in a desert area except where water is available for irrigation. He will come to understand that sand dunes in a desert make travel difficult.

CONCEPTS AND GENERALIZATIONS: D_4, D_5, D_6

MATERIALS

1. Group K film.

PROCEDURE

1. Write D_4, D_5, D_6 on the board and discuss them with pupils. Substitute words where necessary to promote meaning.

2. Ask them to look for specific application of the concepts and generalizations in the film.

3. Show the film, "Egypt and the Nile."

4. Ask pupils to indicate specific applications of D_4, D_5, D_6 as they occurred in the film.

5. Show the film a second time with the sound off.

6. As the film is played a second time, point out to pupils where D_4, D_5, D_6 can be applied in the film.

7. Bring the lesson to an appropriate close.

Lesson 15, Deductive

OBJECTIVES

The child will come to understand that people live in desert areas only where water is available for irrigation of the land or in areas where oil wells are being drilled.

CONCEPTS AND GENERALIZATIONS: D_4, D_5, D_6

MATERIALS

1. Group M films.

PROCEDURE

1. Write D_4, D_5, D_6 on the board and discuss them with pupils.

2. Ask them to look, with you, for specific instances where the concepts and generalizations can be applied.

3. Show the films, "Life in the Sahara" and "Libya Ahead,"

4. Discuss with pupils where D_4, D_5, D_6 were applied in the film. Place particular emphasis upon D_6 where it refers to commercially valuable minerals (oil) in the film, "Libya Ahead."

5. Bring the lesson to an appropriate close.

Lesson 17, Deductive

OBJECTIVES

The child will grow in his understanding of the types of animal life found in the jungle. He will also come to an understanding that the rapid growth of vegetation occurs wherever the sun reaches the ground in the tropical rainforest.

CONCEPTS AND GENERALIZATIONS: J_3, J_5, J_6

MATERIALS

1. Group O films.

PROCEDURE

1. Write J_3, J_5, J_6 on the board and discuss them with pupils.
2. Ask pupils to look for specific application of these concepts and generalizations in the showing of the film.
3. Show the films in this order: "Animals of the Indian Jungle"
   "Life in the Hot Rainforest"
4. Following the showing of the films, demonstrate and/or discuss the following with pupils:
   a. The location of the tropical rainforest in relation to the equator (have pupils recall this from the films).
   b. The basic types of animals found in jungle areas.
   c. Jungle growth which occurs near banks of rivers should be pointed out as it occurred in the films. Also stress the constant clearing of the open fields ("Life in the Hot Rainforest") to keep them from becoming jungle areas.
5. Bring the lesson to an appropriate close.

Lesson 19, Deductive

OBJECTIVES

The child will increase his knowledge of the general conditions existing in a tropical rainforest; he will gain in his understanding of the jungle as a part of the tropical rainforest.

CONCEPTS AND GENERALIZATIONS: J_3, J_6

MATERIALS

1. Group Q film.

PROCEDURE

1. Write J_3 and J_6 on the board. Discuss them with pupils. Tell pupils that they will see how these ideas are applied in the film.
2. Show the film, "Jungle Survival."
3. Discuss with pupils the application of J_3 and J_6 as they appeared in the film.
4. Make the distinction for and with pupils between the tropical rainforest and the jungle. Insure that they understand that the jungle is part of the larger concept of the tropical rainforest.
5. For an understanding of the film, "Jungle Survival," pupils will need to know that a savanna is at the edge of the tropical rainforest. The savanna, in this specific case a high-grass, low tree savanna, is a transition between the tropical rainforest and other types of physical-geographical regions. A savanna is highlighted in parts of the film.

Lesson 1, Intuitive

OBJECTIVES

The child will perceive a causal relationship between the lack of vegetation, cloud cover, water vapor and the great change in temperature from day to night in the desert.

CONCEPTS AND GENERALIZATIONS: D_1

MATERIALS

1. Group A filmstrips: Desert filmstrip 187-A-1.
2. Diagram of heat absorption and loss.
3. Duplicated sheet of above for each pupil.
4. Sheet of paper for each pupil.

PROCEDURE

1. View filmstrip No. 1, "Desert," from Group A. Have pupils fill in missing words or letters in the programmed frames.

2. Show the filmstrip again rather quickly to reinforce the material presented.

3. Ask pupils questions such as the following:

    a. Why do you suppose there is such a great change in temperature from day to night in the desert?

    b. Have you ever walked barefooted on a sandy beach on a hot summer afternoon when the sun was shining brightly? How did it feel? Have you walked barefooted on a sandy beach on a summer evening or summer night after the sun has gone down? How did it feel? Why do you think the sand is so hot during the day and yet so cool at night?

    c. Show pupils the diagram from The Desert, Life Nature Library without titles or subtitles. Give each pupil a copy of the diagram. Ask pupils to hypothesize what they think it means. Point out to them the clouds, the trees, the water and the humid land and the lack of it in the desert. Elicit ideas from them to see if they can come to an understanding of the causal relationships between vegetation, cloud cover, etc., and the lack of them as they relate to changes of temperature in the desert.

    d. Ask pupils about their experiences in trying to sleep on a hot, humid summer night. What makes it so hot and so uncomfortable? The deserts are never this way. Why?

   e. Ask pupils why they cover themselves with blankets to sleep in the winter. What would it be like if they had no blanket? Try to relate this to heat loss in a desert since there are no clouds or water vapor to "hold in" the heat of day.

4. At this point elicit from pupils the information to check to see if they have the requisite understandings of:

   a. great changes in temperature in the desert from day to night.

   b. lack of sufficient vegetation to protect land from hot sun.

   c. few, if any, clouds in the sky.

   d. little water vapor in air.

5. Allow children to discuss these items. Do not tell them the information if they do not possess it.

6. Ask pupils the question: "Why are there such great changes in temperature in the desert?" Do not place value on pupil response (e.g., that's good, Johnny). Rather say: "What do you think about what Johnny said?" Allow pupils to discuss reasons. Refer questions and answers of pupils to other pupils for discussion (e.g., "What do you think about what Johnny just said, Sue?").

7. Do not verbalize the concept or generalization under consideration for the pupils. Do not ask them directly to verbalize it. Be careful not to reward overtly by expression, verbal or facial, a child who should happen to verbalize it. To do so may encourage a child to imitate another child's understanding without necessarily having achieved it himself.

8. When pupils have been allowed sufficient time to discuss or think about the key question which you have posed, close the lesson with an appropriate remark, such as "well boys and girls, this has been an interesting lesson and discussion. We'll be talking about the desert for the next few days. We'll see more films and filmstrips which you will find very interesting, I'm sure."

Lesson 2, Intuitive

OBJECTIVES

The child will gain the understanding that a desert is a dry place with little rain; he will come to understand that the rain which does fall in the desert evaporates very quickly.

CONCEPTS AND GENERALIZATIONS: D_1, D_2

MATERIALS

1. Group a filmstrips, filmstrips 187-A-2 to 187-A-5.
2. Map: "Desert Lands of the World."
3. Map: "Rainfall Map: Selected Regions of the World."

PROCEDURE

1. Give pupils their individual maps of rainfall and the deserts. Ask them to compare and contrast the two maps. Ask pupils what they think they are going to do with them. Have pupils do some of the following:

    a. Compare the amount of moisture which falls in the northeast United States where they live with that which falls in desert areas.

    b. Compare location of desert lands with rainfall map.

2. Show each of the filmstrips in Group A, beginning with #2, in sequence. If you feel it desirable, you may briefly review filmstrip 1 which was shown in lesson 1. Spend little time on filmstrip #4 as the topic will be dealt with in more detail in other lessons.

3. Ask pupils the question, What is a desert?

4. Do not verbalize the concept or generalization under consideration for the pupils. Do not ask them directly to verbalize it. Be careful not to reward overtly by expression, verbal or facial, a child who should happen to verbalize it. To do so may encourage a child to imitate another child's understanding without necessarily having achieved it himself.

5. If pupils should stray from the major concept under consideration, then pull them back by a comment such as:

    a. "Let's go back and talk a little more about what Sue said. Will you repeat for us what you said, Sue?"

    b. "That's very interesting, Jimmy, but let's save that for another time."

6. When pupils have been allowed sufficient time to discuss or think about the key question which you have posed, close the lesson with an appropriate remark such as; "Well, boys and girls, this has been an interesting lesson and discussion. We'll be talking about the desert for the next few days. We'll see more films and filmstrips which you will find very interesting, I'm sure."

Lesson 3, Intuitive

OBJECTIVES

The child will reinforce his understanding of what constitutes a desert, will reinforce his understanding of the common characteristics of deserts, and will attain the understanding that sand dunes hinder transportation in a desert.

CONCEPTS AND GENERALIZATIONS: D_2, D_3, D_4

MATERIALS

1. Group B filmstrips
2. Set of 5 "Curriculum Color Prints"
3. A globe
4. Map: "Desert Lands of the World"

PROCEDURE

1. Show the filmstrip, "The Great American Desert."

    a. After the first few frames which stress the dryness of the desert, ask pupils the question, "What really makes a desert?"

    b. Show the remainder of the filmstrip. Reinforce the concepts which hopefully the pupils have previously established--that the desert is a dry place. Spend some time on frames which indicate why the desert is dry. In particular, ask the pupils to try to explain the diagram in frame 12 in terms of why the desert is a dry place.

2. After viewing the filmstrip, ask the pupils how they think plants and animals can survive in a place that is so dry. Allow them to discuss this.

3. Show the filmstrip, "Climate and Man," as follows:

    a. Show frames 1-6 briefly, establishing the terms weather and climate, etc. Define these terms for them if they are beyond the experience range of the pupils.

   b. Ask pupils the question, "How can plants live in the desert if it is such a dry place?"

   c. Ask pupils to locate the major desert regions of the world on frame 13. Have them locate the major desert areas of the world on their own individual map.

   d. Skip to frame 17. Spend some time on frames 17 and 18, giving pupils the concept of irrigation. They will most likely be able to grasp the essence of irrigation but the term itself may have to be given to them.

   e. Stop viewing the filmstrip after frame 18. Shut off off the projection lamp and remove the filmstrip.

4. Show the filmstrip, "Vegetation and Man," as follows:

   a. Go directly to frames 20-23.

   b. Briefly discuss these frames in reference to adjustment of plant life.

   c. Turn off projector and remove filmstrip.

5. Display the set of 5 "Curriculum Color Prints" for the children. Then ask the following questions:

   a. What characteristics do these 5 color prints have in common? Why do some differ from others? Take a closer look. What are the common characteristics of deserts?

   b. As a side issue, ask pupils to observe print no. 2 and ask them how they think it would be to travel in an area represented by the sand dunes as compared with some of the other areas. Guide them to discover the fact that sand dunes in a desert area make travel difficult.

6. Bring the lesson to an appropriate close (e.g., we'll talk more about this tomorrow. You'll be able to talk about these ideas which you have mentioned today).

Lesson 4, Intuitive

OBJECTIVES

The child will perceive that plants and animals of the desert have adjusted to the high heat and the low amount of moisture.

CONCEPTS AND GENERALIZATIONS: D_2, D_3, D_4, D_5

MATERIALS

1. Group C filmstrips

PROCEDURE

1. Show the filmstrip, "Deserts," T435-8.
    a. Ask pupils how the traveling would be in the desert pictured in frame 3.
    b. Ask pupils to discuss the meaning of the diagram in frame 4.
    c. Ask pupils, after they have viewed the entire filmstrip, how plants and animals can live in the desert.
2. Show the filmstrip, "Plants and Animals of the Desert," A-462-2, as follows:
    a. Ask pupils the following question: "How is it that plants and animals can live in the desert? As usual, do not reward answers. Refer questions to other pupils to answer. Bring pupils back to the main point of discussion if they should stray.
3. Show the filmstrip, "How Animals Live in the Desert," 446.
    a. Ask pupils after viewing, the following question: "How is it that plants and animals can live in the desert?" Allow them to discuss this question among themselves.
4. Bring the lesson to an appropriate close.

Lesson 5, Intuitive

OBJECTIVES

The child will broaden his understanding of how plants and animals adjust to the desert environment.

CONCEPT AND GENERALIZATION: D_4

MATERIALS

1. Group D filmstrips

PROCEDURE

1. Show the filmstrips in this order:
    a. "Plant Life in the Desert"
    b. "Desert Life Community"
    c. "Reptiles of the Desert"
2. Have pupils discuss the following question:
    a. Do you have any better ideas now about how plants and animals are able to live in the desert?
    b. All three filmstrips will tend to give background information needed to form the concepts and generalizations about the desert. Care should be taken so that pupils are not led astray to a discussion of irrelevant topics.
3. Allow pupils as much discussion time as is reasonable and necessary. Pupils may have a tendency to talk specifically about particular plants or animals. To bring discussion back into focus, if needed, as the following question: "What could be said about all the plants and animals in the desert?"
4. Bring the lesson to an appropriate close.

Lesson 6, Intuitive

OBJECTIVES

The child will perceive the relationship between sources of water in the desert and the number of people who live there. He will gain an understanding of the methods of irrigation and its necessity if life is to be sustained in desert regions.

CONCEPTS AND GENERALIZATIONS: D_4, D_5, D6

MATERIALS

1. Group E filmstrips

PROCEDURE

1. Show the following filmstrips in the order indicated:

    a. "Life in Desert Lands," 349086
    b. "Oases in Libya," 9222
    c. "Life Along the Nile," 9221
    d. "Life in Egypt," 183

2. After viewing all the filmstrips in the group, pose the following questions:

    a. What is an oasis?

    b. Do many people live in the desert? If so, why? If not, why? (These latter questions will depend upon pupil response).

    c. Where would you most likely find people living in a desert region?

3. Once again, do not rephrase pupil responses or reward them in any way. Insure that pupils have sufficient information to attain the concepts or generalizations under consideration. Then ask the key questions which would require them to relate the information which they have gained. Having a familiarity with the topic for discussion, the purpose is to see if they can leap intuitively to the concept or generalization inherent in the information presented.

Lesson 8, Intuitive

OBJECTIVES

The child will come to an understanding that it is hot and wet in the tropical rainforest; that it rains daily with heavy storms coming in mid-afternoon; that ground vegetation is sparse due to absence of sunlight on the ground.

CONCEPTS AND GENERALIZATIONS: J_1, J_2, J_4

MATERIALS

1. Group E filmstrips, Tropical Rainforest 187-G-4, 5, 6.
2. Diagram of parts of a tree (chart as in lesson 7).

PROCEDURE

1. Show filmstrips 4 and 5 of group F.
    a. Show diagram of the parts of a tree. Have pupils note the crown of the tree.
    b. Ask the pupils the following questions:
        (1) What does a plant or tree need in order to grow? (You may guide and rephrase pupil responses to this question).
        (2) Why do trees grow so tall in the tropical rainforest? Do not guide the discussion other than to keep it on the subject at hand.
        (3) What is it like on the ground in the tropical rainforest?
        (4) If the tall trees grow closely together at the crowns, what would the plants be like on the ground of the rainforest?
2. Once again, do not rephrase pupil responses or reward them in any way. Insure that pupils have sufficient information to attain the concepts or generalizations under consideration. Then ask the key questions which would require them to relate the information which they have gained. Having a familiarity with the topic for discussion, the purpose is to see if they can leap intuitively to the concept or generalization inherent in the information presented.
3. Show filmstrip No. 6 which is a test. If the class indicates the need to review filmstrips 1, 2 and 3, do so at this time.
4. Bring the lesson to an appropriate close.

Lesson 10, Intuitive

OBJECTIVES

The child will come to an understanding that birds, snakes, and monkeys are found in the tropical rainforest.

CONCEPTS AND GENERALIZATIONS: J_5

MATERIALS

1. Group H filmstrips

PROCEDURE

1. Show the filmstrips in this order:
    a. "Birds of the Tropical Forests," 8975
    b. "Reptiles and Amphibians of the Tropical Forests," 8976.
    c. "Monkeys of the Tropical Forests," 8973.

2. After viewing, ask the following question:
    a. Generally, what kinds of animals are found in the tropical rainforest?

3. Close the lesson appropriately after pupils have had an opportunity to discuss the question among themselves.

Lesson 12, Intuitive

OBJECTIVES

The child will grow in his ability to comprehend the elements of the desert and life in the desert as expressed in the concepts and generalizations which are central to the unit of study.

CONCEPTS AND GENERALIZATIONS: D_2, D_3, D_4, D_5, D_6

MATERIALS

1. Group J film

PROCEDURE

1. Show the film, "Life in Hot, Dry Lands."

2. Rewind the film and show it again with the sound off. Ask the following questions at appropriate places in the film during the second showing:

    a. Why is the desert such a dry place?

    b. How do plants and animals live in a place that is so hot and has so little water?

    c. Would sand dunes make travel difficult? Why?

    d. What is an oasis?

    e. If people live in a desert, where would you most likely find them?

3. Upon completion of the second showing of the film, pose once again the questions listed above. Allow the children dren to discuss the questions. Remember, do not sanction responses given by pupils. Bring pupils back to the point of discussion if they should stray.

4. After sufficient discussion, bring the lesson to a close.

Lesson 14, Intuitive

OBJECTIVES

The child will grow in his ability to comprehend the elements of the desert and life in the desert as expressed in the concepts and generalizations which are central to the unit of study.

CONCEPTS AND GENERALIZATIONS: D_1, D_2, D_3, D_4, D_5, D6

MATERIALS

1. Group L films

PROCEDURE

1. Show the films, "Life in an Oasis" and "The Desert."

2. Have the pupils discuss the following questions:

   a. What is a desert?

   b. How do plants and animals survive the high heat and the low amount of moisture?

   c. Where do you find people living in a desert?

   d. How would sand dunes affect travel in the desert?

3. Bring the lesson to an appropriate close.

Lesson 16, Intuitive

OBJECTIVES

The child will develop an understanding that desert lands can become productive when irrigated.

CONCEPTS AND GENERALIZATIONS: D_6

MATERIALS

1. Group N film.

PROCEDURE

1. Show the film, "Water in the West."
2. Discuss the film with pupils and ask the following questions:
   a. Why has our government gone to so much trouble to build dams in the western part of our country?
   b. Why is water so important?
   c. What is irrigation? Why is it so important to people who live in dry lands.
3. Bring the lesson to an appropriate close.

Lesson 18, Intuitive

OBJECTIVES

The child will grow in his understanding of the tropical rainforest in terms of amount of rain and rapid growth of vegetation.

CONCEPTS AND GENERALIZATIONS: J_1, J_2, J_3, J_4, J_5, J_6

MATERIALS

L. Group P films

PROCEDURE

1. Show the films in this order: "Life in Hot, Wet Lands"
   "The Tropical Rainforest"
2. Upon completion of the showing, ask pupils the following questions:
   a. Where are tropical rainforests located?

b. What is the temperature in the tropical rainforest throughout the year?

c. How much more frequently does it rain in the tropical rainforest than it rains where we live?

d. What types of animals live in the tropical rainforest?

e. Where do you find plants, grasses and bushes growing thickly in the tropical rainforest?

3. Allow pupils to discuss the questions which you posed. Once again, do not rephrase pupil responses or reward them in any way. Insure that pupils have sufficient information to attain the concepts or generalizations under consideration. Then ask the key questions which would require them to relate the information which they have gained. Having a familiarity with the topic for discussion, the purpose is to see if they can leap intuitively to the concept or generalization inherent in the information presented.

4. Bring the lesson to an appropriate close.

Lesson 20, Intuitive

OBJECTIVES

The child will gain an understanding of the water cycle and how it relates to the climate of the tropical rainforest.

CONCEPTS AND GENERALIZATIONS: J_1, J_2

MATERIALS

1. Group R film

PROCEDURE

1. Show the film, "The Water Cycle."

2. Ask pupils the following question: "What is the water cycle?"

3. Ask pupils to tell what this film means as they think about the tropical rainforest.

4. Replay the film with the sound off. At several points during the replay of the film, ask pupils to think about the water cycle in relation to the tropical rainforest. When the film is over, allow pupils to discuss the question, "What could this film tell me about the tropical rainforest?"

5. Bring the lesson to an appropriate close.